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ABSTRACT

The growth trends in foreign involvement in United States science and engineering show no signs of changing. This situation has raised a number of questions among public and private sector science and technology policy officials regarding the possible impacts on U.S. higher education and industry. This report identifies and assembles available statistics pertaining to these issues. The report is organized into six sections. The first five sections present data on U.S. higher education at all levels. This includes information on: (1) foreign students in U.S. higher education; (2) foreign students in graduate science and engineering; (3) foreign recipients of U.S. science and engineering doctoral degrees; (4) academic employment; and (5) scientists and engineers from abroad in the U.S. work force. A final section considers alternative futures for U.S. and foreign participation in science and engineering in higher education in the United States. The information contained in the report is intended to lend perspective and understanding to the issues, and to assist in the discussion of policy issues. The appendices contain numerous technical notes and supporting statistical tables. (TW)

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foreword

The state of U.S. science and engineering, now and in the future, and our dependence on science and technology to meet the Nation's goals in such areas as economic growth, international competitiveness, and national defense have long been topics of major concern to government policymakers and to the broader public. Recently, issues related to the involvement of foreign nationals in U.S. science and engineering have attracted increasing attention. These concerns all point to one overriding question: considering the goal to maximize the participation of U.S. citizens—men, women, minorities, handicapped persons—what is the appropriate level of non-U.S. citizens' participation needed to meet the U.S. demand for highly qualified scientists, engineers, and technicians? The question is more easily stated than answered. U.S. foreign policy, specific international events, and matters of national security are prime examples of externalities that must be factored into the attempt to respond to the question. This report assembles in one volume statistics from several sources on the participation of foreign nationals in U.S. science and engineering, with emphasis on their roles in higher education, as students and faculty, and on their involvement in the science and engineering labor market. It updates earlier versions of this document with all information available as of October 1986.

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Division of Science Resources Studies
Directorate for Scientific,
Technological,and International
Affairs

December 1986

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Special thanks are in order to the Institute of International Education for permitting the use of considerable data on foreign student enrollment, and to the Educational Testing Service for permission to use data on Graduate Record Examination scores.

notes

A discussion of each of the several data bases used in this report is included in the technical notes. Where additional sources were used for single data tables or discussion in the text, citations are given with the reference.

The terms "foreign citizens" and "non-U.S. citizens" are used interchangeably throughout the report to designate persons with citizenship in a country other than the United States at the time of data collection. Thus this group includes those on permanent (immigrant) visas as well as those on temporary (student, diplomatic, or other) visas, unless otherwise noted. Where data permit, the two groups are considered separately.

"Doctorate-granting institutions" include institutions which grant a doctorate-level degree in any science or engineering (S/E) field. Doctorate-granting institutions include departments granting doctorate-level degrees and master's degrees. "Master's-granting institutions" are those whose highest degree in any S/E field is at the master's level.

Some abbreviations and acronyms are used in this report. They are:

CES - Center for Education Statistics
GRE - Graduate Record Examination
IIE - Institute of International Education
NRC - National Research Council
NSF - National Science Foundation
S/E - Science and engineering

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introduction

After World War II, the United States became a magnet for foreign students who, for the first time, began to exceed the number of U.S. students studying abroad. This change resulted from a number of factors. In the years immediately following World War II, the United States embarked upon a series of programs whose objective was to rebuild the European economy. This endeavor included providing a source and means for education of European students from countries whose higher education facilities had been destroyed in war. The Fulbright scholarship, instituted in 1946, was one such program. The targeted area was expanded in 1948 with the passage of the Smith-Mundt Act and, in 1956, with the establishment of the Point IV program.

Changes in U.S. immigration laws affected greatly the numbers of non-European students. Between 1924 and 1952, U.S. immigration was governed by a set of quotas based on the 1924 National Origins Act. In 1952, the McCarran-Walter Act liberalized immigration quotas for Asiatic nationalities to accommodate the increase in refugees from China. The law was amended in 1965 to abolish the strict quota limitations on the basis of national origin. The impact of the 1965 action is evident in foreign scientist and engineer immigration figures which show Asians accounting for more than one-half of all scientists and engineers immigrating to the United States between 1970 and the present.

From all indications, the growth trends in foreign involvement in U.S. science and engineering show no signs of abating. This situation has raised a number of questions among public and private sector science and technology policy officials over the possible future impacts on U.S. higher education and industry. The following are some of the more frequently expressed concerns:

(1) To what extent are U.S. taxpayers subsidizing the education of foreign students?
(2) Are U.S. institutions of higher education becoming dependent on foreigners for faculty and graduate enrollment in science and engineering?
(3) Does the presence of large numbers of foreign graduate students cause institutions to alter course content to the detriment of graduates seeking employment in U.S. industry?
(4) Does the presence of foreign citizens in the U.S. science/engineering (S/E) labor force affect salary levels?
(5) Is national security compromised by the presence of foreign scientists and engineers?
(6) Does the possible return of scientists and engineers to their native countries pose a threat to the long-term competitiveness of U.S. firms?
(7) Do language and cultural differences create problems for U.S. universities and colleges when foreign citizens become faculty members in science and engineering?
(8) Are there similar problems when foreign citizens assume managerial positions in U.S. firms?
(9) What impact would sudden changes in U.S. foreign policies have on the status of non-U.S. citizens in the science and technology labor force?

This report identifies and assembles available statistics pertaining to these issues. The report is organized into six sections. The first five sections present data on U.S. higher education at all levels, graduate S/E education, doctorate awards, academic employment, and the U.S. S/E labor force. A final section considers alternative futures for U.S. and foreign participation in science and engineering in U.S. higher education. The information contained in the report is intended to lend perspective and understanding to the issues and to assist in the discussion of policy options.

highlights

higher education at all levels

- In 1985, nearly 344,000 foreign students were studying at U.S. institutions of higher education. About one-half of these students were enrolled in science and engineering (S/E) courses of study, a share that has remained steady for 20 years. Foreign students constitute less than 3 percent of U.S. higher education enrollment overall.

- A sustained increase in numbers of students from South and East Asia has increased their proportion of the total number of foreign students from 30 percent to 40 percent over the past 30 years.

undergraduate s/e enrollment and degrees

- More than one-half of all foreign students are studying at the undergraduate level. The proportions studying at this level have been increasing for most areas of science and engineering. Relative to U.S. citizens, however, foreign undergraduates in U.S. institutions constitute a relatively small part of the total student population.

- Foreign students on temporary visas earned 12,600 bachelor's degrees in S/E fields in 1983, 62 percent more than in 1976. The proportion of all bachelor's degrees earned by foreign students, however, has remained under 5 percent in each broad S/E field except engineering, where it has been close to 8 percent.

graduate s/e enrollment

- By 1985, over 66,100 foreign students were enrolled full time in graduate S/E programs at doctorate-granting institutions. They comprise over one-fourth of all full-time graduate S/E enrollment in these institutions. Steady increases have occurred simultaneously with stable and, in some cases, declining enrollment among U.S. students.

- Foreign student full-time enrollment in engineering increased nearly 7 percent per year in doctorate-granting institutions during 1979-85. Within engineering fields, the greatest average annual increase (9 percent) occurred in electrical engineering.

- Foreign student enrollment in science also increased about 7 percent per year during 1979-85. Among science fields, the greatest average annual increase in foreign student enrollment during this period occurred in computer sciences (21 percent); the number of foreign graduate students in this field tripled to a total of 4,900. Computer sciences was also the field with greatest growth for U.S. students.

- Foreign citizens who take the Graduate Record Examination have scores that, on average, are slightly higher than those of their U.S. counterparts on quantitative measures, somewhat lower on analytic, and much lower on verbal measures. Other differences between U.S. and foreign students, cited in anecdotal literature, include limited "hands-on" experience by foreign students but strong backgrounds in mathematics and theoretical concepts.

- Foreign graduate students now are distributed more evenly across S/E departments grouped by quality than they were in 1974. The proportion of all foreign students enrolled in the highest-ranked departments dropped from 20 percent in 1974 to 16 percent in 1979. The rising numbers of foreign students in S/E fields overall have increased the proportions of foreign students in those departments with lower quality rankings.

s/e doctoral degrees

- Beginning in 1981, and for every year since then, more than one-half of the engineering doctorates awarded in the United States have been to foreign citizens. By 1985, foreign citizens earned 57 percent of engineering doctorates and about 40 percent in both mathematics and computer sciences. Foreign citizens earned more than one-quarter of the Ph.D. degrees in the physical and social sciences. They earned 22 percent of all science doctorates.

- Foreign citizens have earned increasing numbers of doctorates; U.S. citizens have earned fewer. Women are earning greater proportions of doctorates among both U.S. and non-U.S. citizens.

- East and West Asian recipients have received significant portions of the doctorate awards to non-U.S. recipients since 1960. The dominance of Asian countries among foreign citizens receiving engineering doctorates is particularly striking, accounting for nearly 70 percent of foreign recipients in 1985.

- For both S/E doctorate recipients, a greater proportion of foreign than U.S. citizens said that university-related sources provided their primary financial support during graduate study. Among U.S. citizens, 54 percent in science and 62 percent in engineering received primary support from university sources; comparable figures for foreign citizens on either permanent or temporary visas exceeded 62 percent in science and 75 percent in engineering.

- Most foreign doctorate recipients on permanent visas report firm plans to stay in the United States upon completion of their degree: 83 percent of science doctorates, 90 percent of engineering doctorates in 1985. Increasing proportions of those on temporary visas are also reporting plans to remain in this country: 50 percent of S/E doctorates overall, up from 29 percent in 1972. Employment in industry and academic institutions (excluding postdoctorates) are accounting for the increases.

academic employment

- Foreign citizens comprised about two-fifths of total postdoctorate employment in 1985, up from one-third in 1979. The S/E fields with the highest concentrations of foreign postdoctorates were the same as those in which foreign citizens comprised the largest proportions of full-time graduate enrollment. Engineering had the highest proportions, with 56 percent of all engineering postdoctorates in 1985 held by non-U.S. citizens.

- Foreign citizens contributed to academic employment as teaching assistants, proportionately more so in engineering than in sciences. Of all 1985 doctorate recipients citing teaching assistantships as their primary source of income, the proportion who were foreign was 25 percent in sciences and 68 percent in engineering. In absolute numbers, however, more foreigners in science than in engineering (650 compared to 200) were among those whose primary support was teaching assistantships.

scientists and engineers in the work force

- About one-half of a sample of over 300 companies surveyed in June 1985 reported hiring foreign scientists and engineers. Foreign and naturalized citizens accounted for one-fifth the S/E employment in these firms.

- Between 1972 and 1982, the proportion of the U.S. S/E work force who were foreign citizens or former foreign citizens who had become naturalized increased from 10 percent to 17 percent. Foreign citizens in the S/E work force were more likely to hold advanced degrees than were U.S. citizens.

section 1.

foreign students in U.S. higher education

This section examines the growing participation of foreign students in U.S. higher education since the mid-fifties at all levels and in all disciplines within the context of overall trends in higher education. The nationality of foreign students, the disciplines attracting them, and the financing of their education are considered. The comparisons made in the course of this review of undergraduate and graduate students combined may include the distribution of the population of foreign students, the distribution of foreign students compared to all students, and finally, the proportions that foreign students comprise of all students.

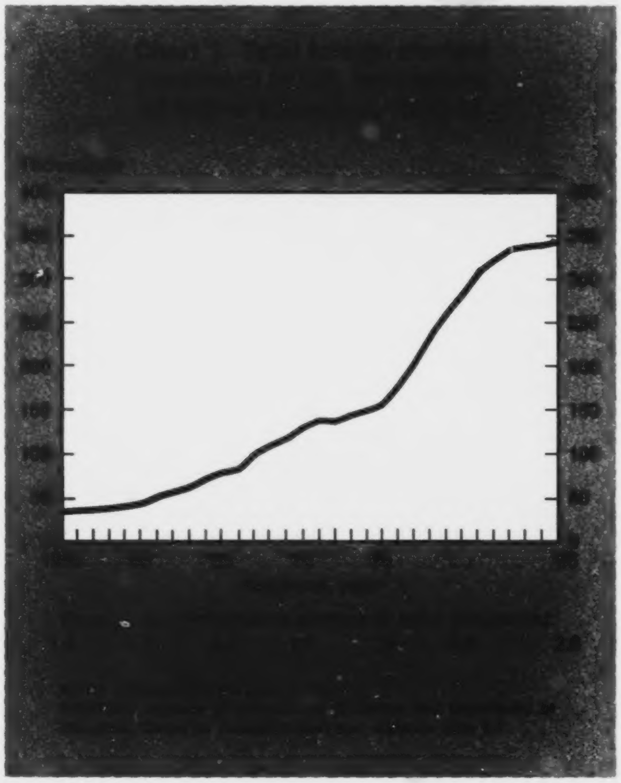
The number of foreign students studying in U.S. institutions of higher education has grown steadily since 1955. Still, foreign students account for less than 3 percent of the total number of students enrolled at U.S. universities and colleges. They come from countries throughout the world, but South and East Asia represent by far the largest sources. The virtually even split in foreign student participation between S/E fields and all other disciplines has changed little in three decades.

numbers of foreign students

The participation of foreign students appears small when compared to total enrollment in U.S. higher education. In 1955, the 34,000 foreign college students in the United States accounted for only 1 percent of total enrollment. For about 20 years thereafter the growth in numbers of foreign citizens in this country on temporary study visas virtually paralleled the substantial growth in U.S. higher education (chart 1). Consequently, despite numbers that more than quadrupled, foreign students remained less than 2 percent of total U.S. higher education students. In 1975, a 5-year period of rapid increase in foreign student enrollment began, with lesser growth occurring into the mideighties, primarily among graduate students. By 1985, however, foreign citizens in this country on temporary (nonimmigrant) visas still were less than 3 percent of all students in U.S. institutions of higher education.

U.S. Federal policy on accepting foreign students in general has been defined by three pieces of legislation: (1) the United States Information and Exchange Act of 1948, the purpose of which was to increase "mutual understanding between the people of the United States and those of other countries;" (2) the Mutual Education and Cultural Exchanges Act of 1961, which provided for the Fulbright scholarship program; and (3) the Foreign Assistance Act of 1961, which established training programs under the aegis of the Agency for International Development.

Although the numbers of foreign students increased tenfold over the 1955-86 period, their proportion depended on the levels of total U.S. enrollment. Since World War II, higher proportions of U.S. youth have continued their education beyond high school. In addition, the post-World War II baby-boom generation reached college age in 1964. As a result, in the years since 1954, total higher education enrollment entered an extended period of growth that peaked around 1982. At that time, the traditional college-going cohort of U.S. citizens 18 to 24 years old reached its maximum and began to decline.[1]



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[1] Data provided by the Bureau of the Census in its *Current Population Reports* show a 15-percent decline in the 18- to 24-year-old cohort between 1981 and 1990, as summarized in the National Center for Education Statistics, *Projections of Education Statistics to 1990-91*, Vol. 1, NCES 82-402-A (Washington, D.C.), p. 14.

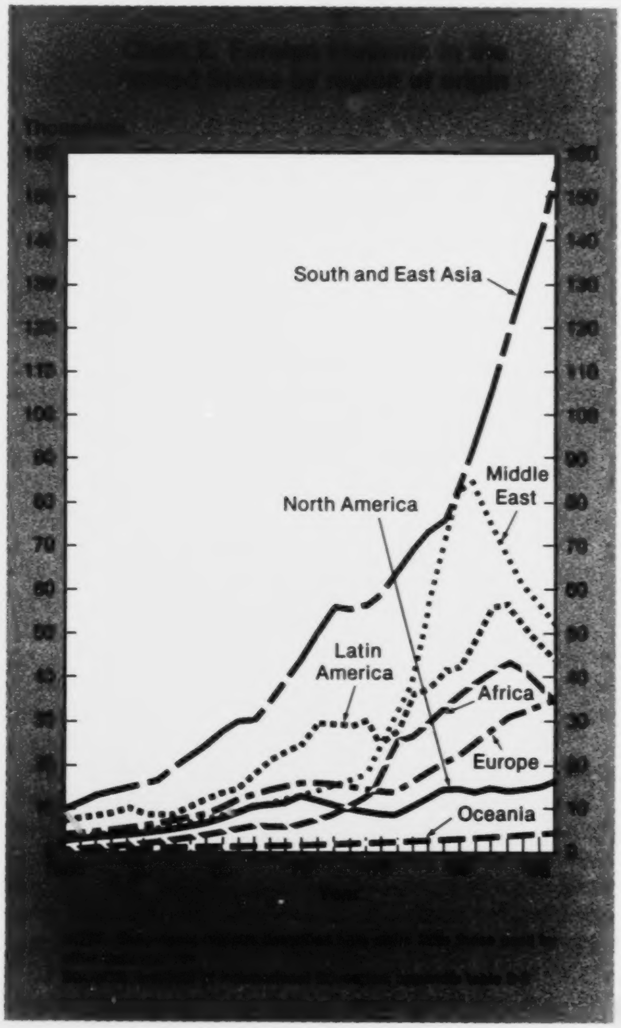
countries of origin of foreign students

There has been a sustained increase in numbers of students from South and East Asia over the past 30 years[2] (chart 2). For virtually all of that period, more than one-third of all foreign students were from Asian countries. By 1985, students from these areas comprised over 40 percent of the total number of foreign students. Four of the leading 10 home countries were East Asian.

Nearly one-half of the foreign students enrolled in American universities and colleges in 1986 came from 10 countries. Six of these countries were also ranked in the top 10 in 1955, the earliest year for which data are available (table 1). In 1979, Organization of Petroleum Exporting Countries (OPEC) nations accounted for 4 of the 10 leading home countries; by 1986, their number had decreased to 2 as recent declines in world oil prices reduced their ability to pay to have their students educated in the United States.

International politics have played at least as large a role as economics in determining what students come to the United States for their education. Throughout the middle and late seventies, Iran accounted for the largest single group of foreign students in the United States, with over 51,000 Iranians—three times as many as the second-ranked country—studying in American universities and colleges in 1980. Following the overthrow of the Imperial Government, however, the number of Iranian students in the United States dropped abruptly. By 1986 Iran had fallen to sixth place.[3] The effect of this drop on the overall trend for foreign students was substantial. From 1980 to 1986, the enrollment of all foreign

Chart 2. Foreign students in the United States by region of origin



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[2] Geographic regions used by the Institute of International Education differ slightly from those employed by the National Science Foundation and National Research Council in analyses of persons earning doctorates. See the technical notes.

[3] Institute of International Education, *Open Doors 1983/84* (New York, 1984), p. 51.

students increased at an average annual rate of 3 percent, but when Iranian students are excluded from the data, there is a 6-percent average annual increase.

Foreign students are not unique to the United States. Although the United States now hosts the largest *number* of foreign students of any country, many other countries have greater *proportions* of foreign citizens among their higher education students. This nation ranked 15th in the *percentage* of foreign students in higher education reported in the early eighties. Of the major industrialized nations, only Japan and the U.S.S.R. ranked below the United States.[4]

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[4] United Nations Educational, Scientific and Cultural Organization (UNESCO): *Statistical Yearbook, 1985* (Paris, 1985).

Table 1. Ten leading countries of origin in foreign enrollment in U.S. institutions of higher education: selected years

1955	Foreign enrollment	Percent distribution	1980	Foreign enrollment	Percent distribution
Country by rank			Country by rank		
Total, all countries	34,230	100.0	Total, all countries	286,300	100.0
Leading 10 countries	17,550	51.3	Leading 10 countries	157,090	54.9
1. Canada	4,660	13.6	1. Iran	51,310	17.9
2. Taiwan	2,550	7.4	2. Taiwan	17,560	6.1
3. India	1,670	4.9	3. Nigeria	16,360	5.7
4. Japan	1,570	4.6	4. Canada	15,130	5.3
5. Philippines	1,480	4.3	5. Japan	12,260	4.3
6. Colombia	1,300	3.8	6. Hong Kong	9,900	3.5
7. Mexico	1,250	3.7	7. Venezuela	9,860	3.4
8. Korea, Republic of ...	1,200	3.5	8. Saudi Arabia	9,540	3.3
9. Iran	1,000	2.9	9. India	8,670	3.0
10. Venezuela	880	2.6	10. Thailand	6,500	2.3
All other countries	16,680	48.7	All other countries	129,210	45.1
1985	**Foreign enrollment**	**Percent distribution**	**1986**	**Foreign enrollment**	**Percent distribution**
Country by rank			Country by rank		
Total, all countries	342,113	100.0	Total, all countries	343,777	100.0
Leading 10 countries	159,310	46.6	Leading 10 countries	162,900	47.4
1. Taiwan	22,590	6.6	1. Taiwan	23,770	6.9
2. Malaysia	21,720	6.3	2. Malaysia	23,020	6.7
3. Nigeria	18,370	5.4	3. Korea, Republic of ...	18,660	5.4
4. Iran	16,640	4.9	4. India	16,070	4.7
5. Korea, Republic of ...	16,430	4.8	5. Canada	15,410	4.5
6. Canada	15,370	4.5	6. Iran	14,210	4.1
7. India	14,610	4.3	7. China	13,980	4.1
8. Japan	13,160	3.8	8. Nigeria	13,710	4.0
9. Venezuela	10,290	3.0	9. Japan	13,360	3.9
10. Hong Kong	10,130	3.0	10. Hong Kong	10,710	3.1
All other countries	182,803	53.4	All other countries	180,877	52.6

SOURCE: Open Doors, Institute of International Education

disciplines chosen by foreign and all higher education students in the united states

Foreign students seek education in this country in disciplines that are comparatively "culture-free" or in which the United States offers strong technological leadership. Thus, foreign students have shown a sustained interest in the study of S/E topics. The share choosing these fields of study has remained very close to one-half for nearly 30 years (chart 3). In comparison, about 30 percent of all bachelor's degrees awarded in the United States are awarded in S/E fields; for master's and doctor's degrees, about 20 percent and 50 percent, respectively.

Foreign students have shifted their choices among the nonscience fields, away from humanities and the fine arts to business, education, and health disciplines (chart 3). Among the S/E fields, agriculture and engineering have attracted relatively stable proportions of foreign students, while mathematics and computer sciences have increased in popularity at the expense of the physical and social sciences (chart 4). Business has become the popular field among all higher education students, U.S. as well as foreign, at the baccalaureate level.

types of institutions

In 1983, about 60 percent of all higher education students in the United States were enrolled in institutions offering four or more years of study. A much higher proportion, over 85 percent, of all foreign students were in 4-year institutions. Furthermore, while the proportion of all students who were enrolled in 4-year institutions declined steadily from 1970 to 1983, the proportion of foreign students enrolled in these institutions has been on the rise since 1980.[5]

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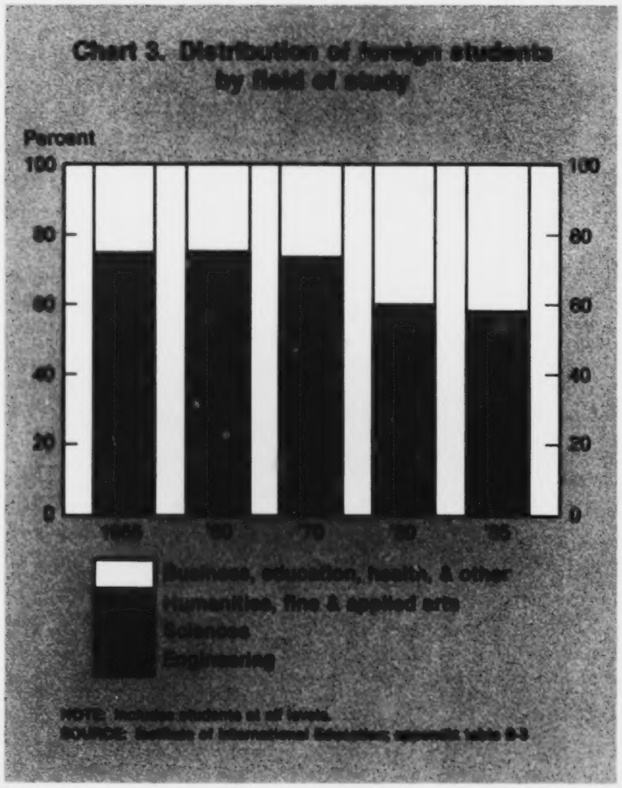
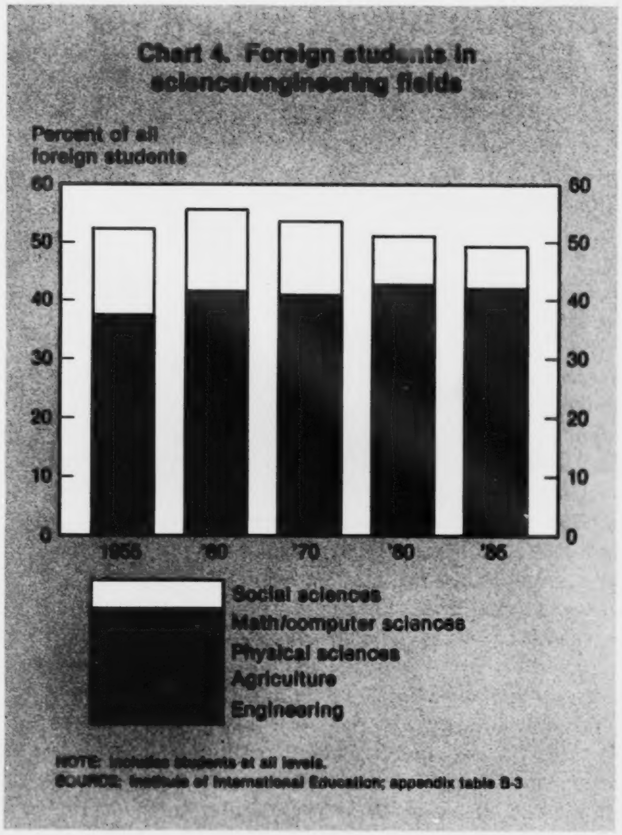
[5] Center for Education Statistics, Department of Education, unpublished tabulations.

Chart 3. Distribution of foreign students by field of study



NOTE: Includes students at all levels.
SOURCE: Institute of International Education; appendix table B-3

Chart 4. Foreign students in science/engineering fields



NOTE: Includes students at all levels.
SOURCE: Institute of International Education; appendix table B-3

leading institutions

The proportion of institutions of higher education reporting that they had some foreign students enrolled rose from 60 percent to 90 percent in the 30 years since 1955. Nonetheless, their enrollment tends to be concentrated in a relatively small number of institutions. The 10 institutions with the largest foreign student enrollment (including undergraduate and graduate levels) accounted for 9 percent of the foreign students in the United States but less than 3 percent of the total enrollment (table 2). Of the leading 10 institutions, 9 offered graduate degrees. Six of the leading 10 were also among the leading 10 in 1979, indicating considerable stability in the concentration. A single 2-year institution appears in this list.

Table 2. Ten leading U.S. institutions in foreign enrollment: 1985

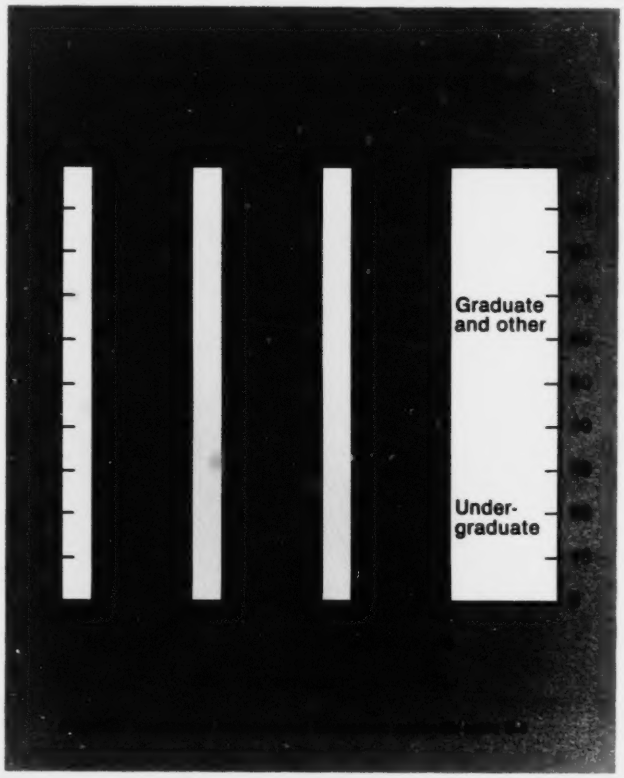
	Institution	Total enrollment	Foreign enrollment	Percent foreign
	Total, all U.S. institutions	12,411,945	343,777	2.8
	Total, leading 10 countries	391,791	29,733	7.6
1.	Miami-Dade Community College	37,082	4,730	12.8
2.	University of Southern California	30,373	3,741	12.3
3.	University of Texas, Austin	47,838	3,132	6.5
4.	University of Wisconsin, Madison	45,050	2,873	6.4
5.	Ohio State University, Main Campus	53,199	2,690	5.1
6.	Columbia University	23,556	2,679	11.4
7.	Boston University	27,181	2,493	9.2
8.	University of California, Los Angeles	34,501	2,488	7.2
9.	University of Minnesota-St. Paul	63,067	2,473	3.9
10.	University of Houston, University Park	29,944	2,434	8.1
	All other institutions	12,020,154	314,044	2.6

SOURCES: Department of Education, Center for Education Statistics, and Institute of International Education

academic level of foreign student enrollment

More than one-half of all foreign students are undergraduates, and the proportion at this level is increasing for most broad areas of science and engineering. Among S/E fields in 1984, engineering had the highest proportion of foreign students at the undergraduate level, nearly 60 percent (chart 5). Agriculture had the lowest proportion of foreign students studying at the undergraduate level, under 37 percent.

U.S. institutions enroll higher proportions of undergraduates than graduate students, with about 80 percent of total enrollment at the undergraduate level. Hence, foreign students constitute a relatively small proportion of the total undergraduate student population. In 1982, foreign citizens on temporary visas comprised less than 5 percent of all undergraduate students in the biological sciences, mathematics, and

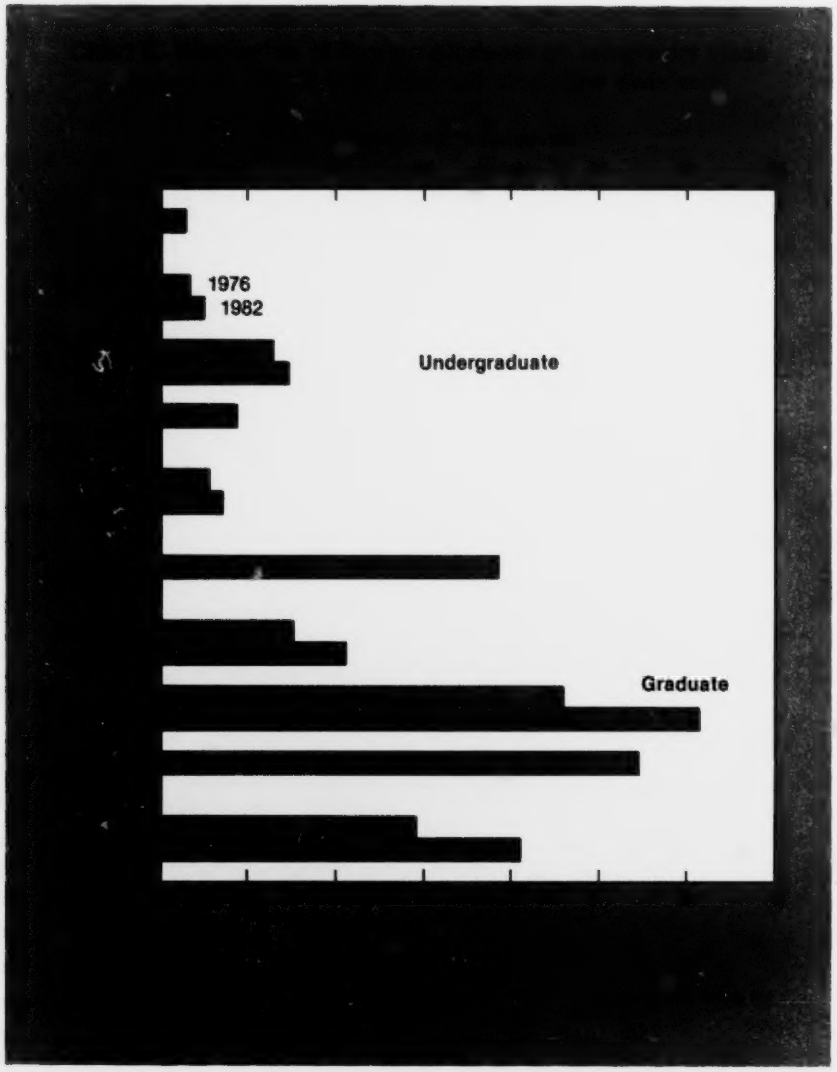


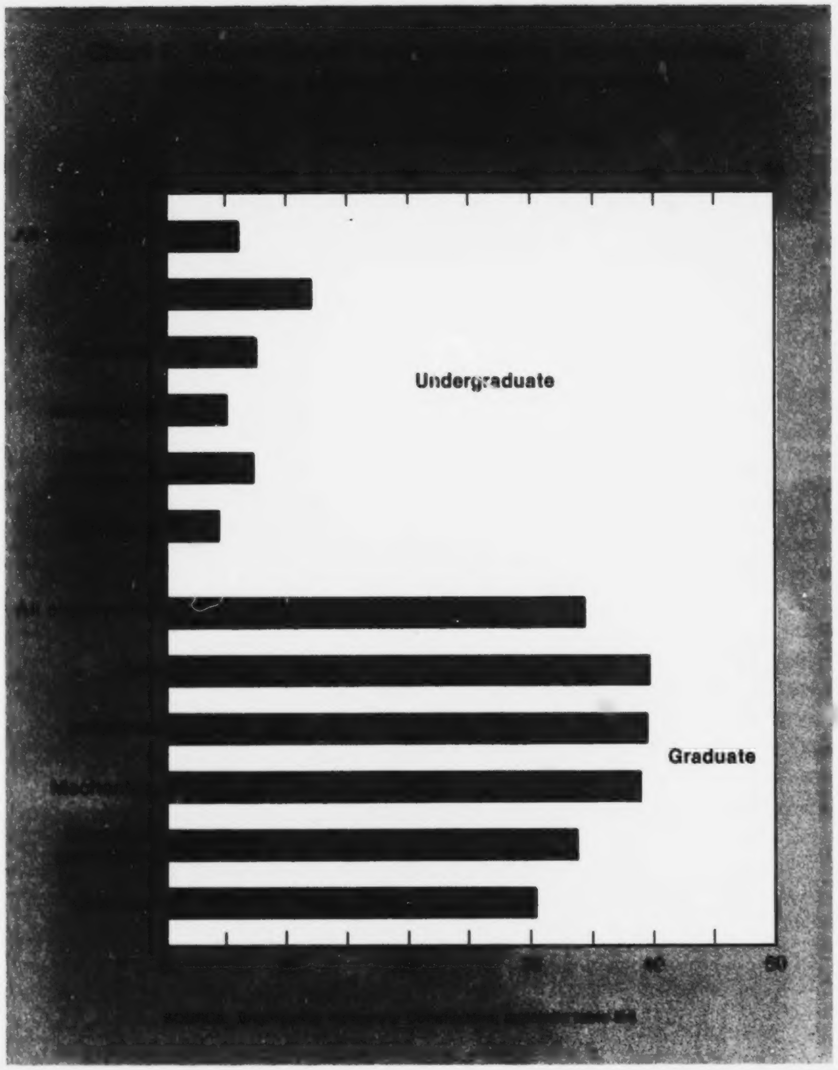
physical sciences; they were 7 percent of all undergraduate engineering students (chart 6). Foreign students on temporary visas comprised higher proportions of all students of the graduate level, reaching 30 percent in engineering.

Within engineering programs, the differential impact of foreign student enrollment (including those on permanent as well as temporary visas) on undergraduate and graduate levels is particularly noticeable. Total undergraduate enrollment in engineering is several times that of graduate enrollment. Therefore, even though there are more foreign students in engineering enrolled at the undergraduate than the graduate level, the foreign student *proportion* of engineering enrollment at the undergraduate level is lower than it is at the graduate level. For example, for five of the largest engineering fields—civil, chemical, electrical, industrial, and mechanical—foreign students were between 4 percent and 12 percent of total undergraduate enrollment, but constituted between 30 percent and 40 percent of total graduate enrollment in these same areas (chart 7).

degrees earned by foreign citizens

The tendencies of foreign students to choose S/E fields, and to enroll at the graduate level in greater proportions than higher education students overall, are manifest in the proportions of all higher education degrees earned by foreign students in the S/E disciplines. Foreign citizens studying on temporary visas have earned increasing numbers of bachelor's degrees in S/E fields. The





12,600 bachelor's degrees earned by foreign citizens in areas of science and engineering in 1983 was 62 percent more than in 1976.[6] The number of awards to foreign citizens has increased faster than the total number of S/E awards. Hence, the proportion of all awards at the bachelor's level that was earned by foreign citizens has increased, though it remains under 5 percent in each field except engineering. In the case of engineering, it has been around 8 percent, except for 1981, when it nearly reached 10 percent (chart 8).

Degree awards to foreign citizens at the master's level in science and engineering were several times as great proportionally as they were at the bachelor's level. The general patterns of large increases in numbers did not occur in the biological sciences, however, where fewer awards were earned by foreign citizens in 1983 than had been in 1979. In the rapidly-growing field of computer and information sciences, the increasing numbers of foreign citizens receiving degrees also constituted an increasing proportion of the total, 22 percent, by 1983.

Foreign citizens earned higher proportions of all degrees from U.S. universities at the doctorate level than at either the bachelor's or master's. The largest numbers of doctoral degrees were earned by foreigners in the physical sciences, social sciences, and psychology, though the highest *proportions* of doctorates to foreigners on temporary visas were awarded in the fields of engineering and agriculture. A more detailed review of doctorate awards to foreign citizens is presented in section 3.

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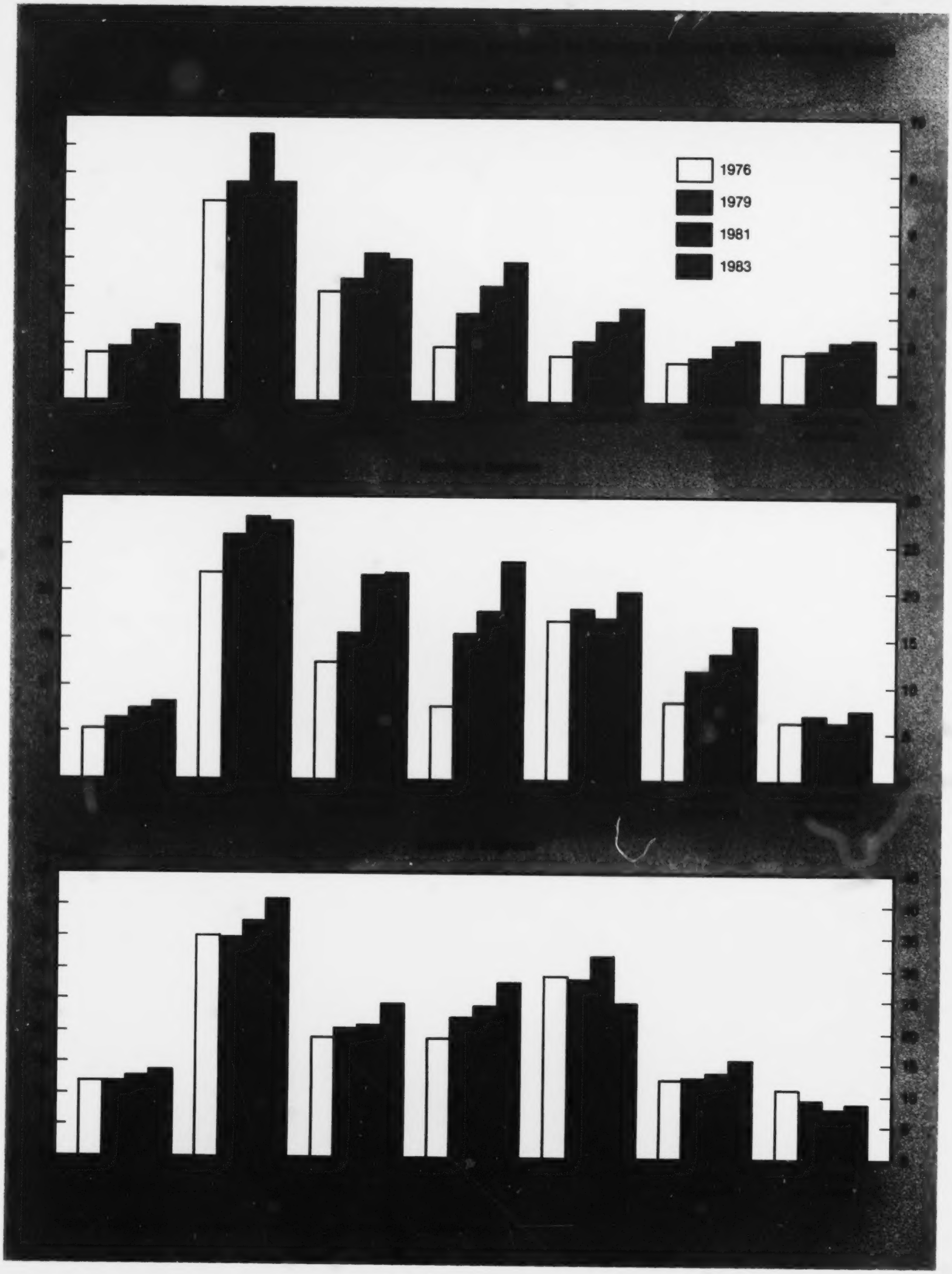
[6] Institute of International Education, *Open Doors, 1983/84*, p. 32, *op cit.*


1976
1979
1981
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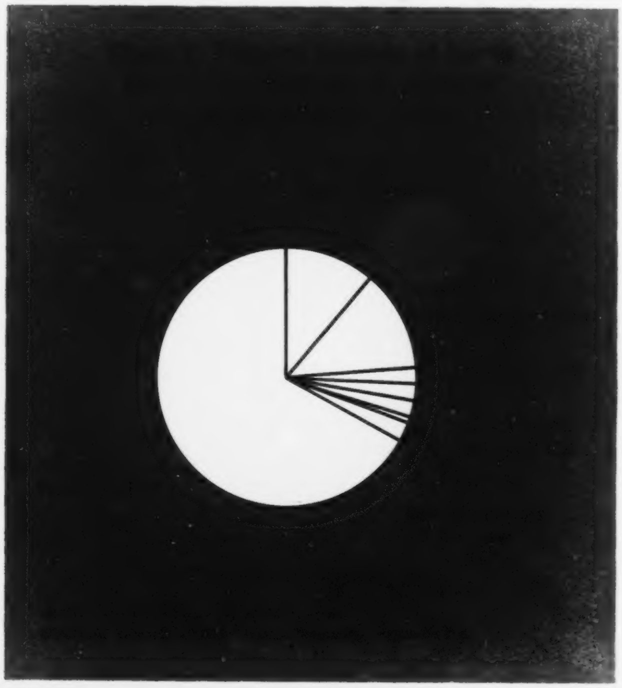
sources of financial support for foreign students

Foreign students have typically been supported by their families or home governments. Almost 80 percent of foreign students at all colleges and universities reported funds originating outside the United States as their primary source of support (chart 9). In 1985, over 67 percent of the foreign students (undergraduate and graduate combined) cited personal and family sources. Of the 20 percent whose primary sources of support were within the United States, about 2 percent listed the U.S. Government as the primary source, while about 12 percent mentioned their college or university. These proportions, available only for foreign students in all disciplines (science and engineering, plus other fields) have remained stable since 1980.



section 2.

foreign students in graduate science and engineering

This section describes the extent of foreign participation in graduate level science and engineering by field and type of institution. It discusses, wherever possible, trends or observed differences in characteristics of foreign and all U.S. students. The geographic distribution of foreign students and their distributions in departments grouped by quality rankings are also reviewed.

The examination, in section 1, of total foreign student enrollment in all fields indicated a recent moderation in the general patterns of increase that marked the late seventies. In fact, the most recent data showed an increase in total foreign enrollment of less than 1 percent overall. Foreign graduate student enrollment in science and engineering, however, continued to rise at an average rate of 7 percent per year.

distribution of foreign s/e students by enrollment status and type of institution

Foreign student enrollment continues to increase at the graduate level in S/E fields. About 81,000 foreign S/E graduate students were reported in 1985, 6 percent more than in the previous year. About 12,100 part-time students were included in the total. Data on the citizenship status of these part-time students has been collected only since 1982, so long-term trends cannot be established. It appears that enrollment patterns for part-time students differ greatly by broad S/E field. Part-time enrollment of foreign citizens in engineering showed a 32-percent increase in 1985 over 1982 (table B-9). In contrast, some broad science fields (the environmental, mathematical, health, and social sciences) were characterized by recent decreases in part-time foreign students, possibly reflecting the fact that many of the foreign students in this country are on temporary student visas which require that they enroll full time. Because of their larger numbers and a more reliable data series on full-time students, the balance of this chapter will focus on them.

Foreign full-time graduate S/E students are enrolled in both master's- and doctorate-granting institutions. Within this group, 96 percent are enrolled at doctorate-granting institutions, a proportion that has remained stable since 1976 (tables B-10 and B-11). The examination of enrollments in S/E fields presented here will focus on these institutions.

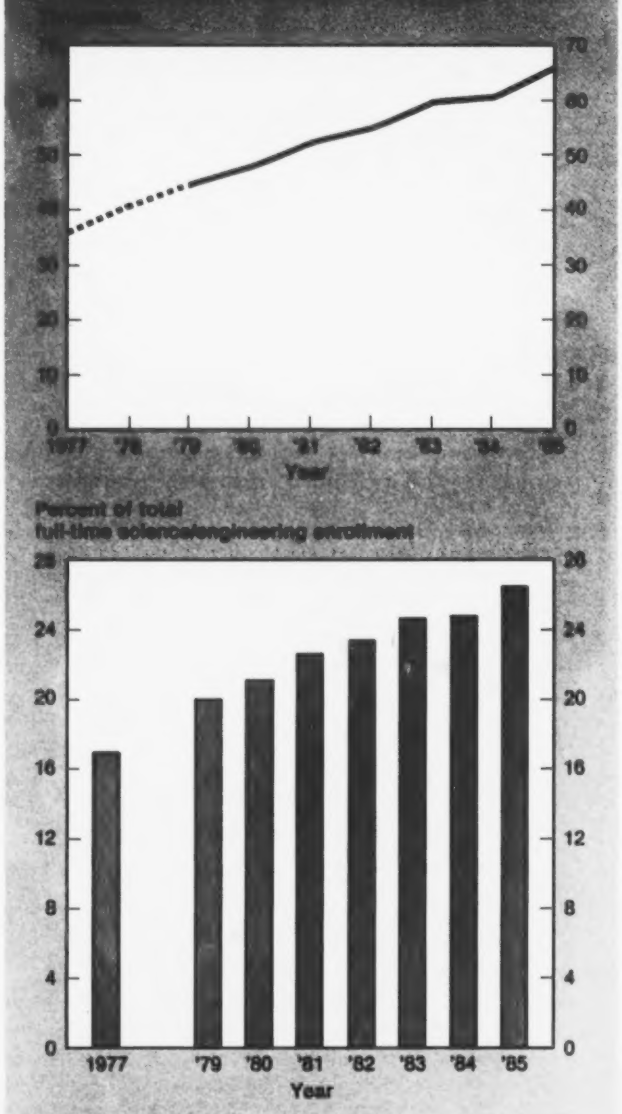
s/e enrollment in doctorate-granting institutions

The number of foreign full-time S/E graduate students in doctorate-granting institutions increased at an average annual rate of 7.6 percent between 1977 and 1985, rising from 37,000 in 1977 to 66,100 in 1985 (chart 10). In contrast, the total number of U.S. citizens enrolled full time was relatively stable over that period, with average annual changes being less than a single percentage point (chart 11).

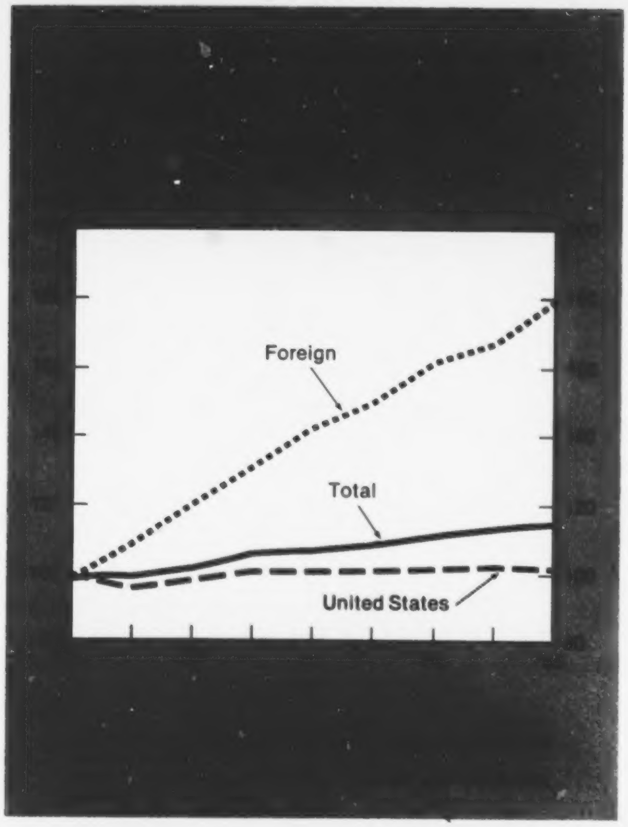
Hence, foreign students constituted a growing proportion of all full-time S/E graduate students in science and engineering, rising from 17 percent to almost 27 percent of the total between 1977 and 1985. Foreign participation in science fields rose from 13 percent of the total to 22 percent and, in engineering, from 36 percent to 42 percent during this period (chart 12).

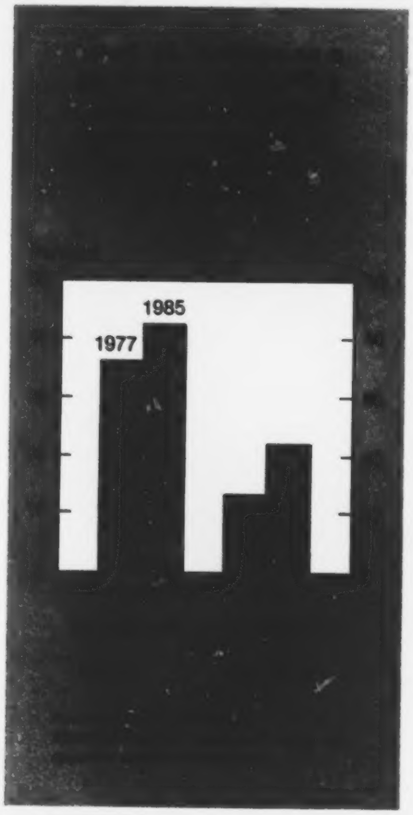
The distribution across S/E fields of U.S. citizens has differed widely from that of foreign citizens, with little change in either group since 1977. In 1985 the largest number of U.S. citizens were enrolled in life sciences, about 30 percent of the total. The social sciences ranked second with 19 percent of the 1985 total. By contrast, the field most often chosen by foreign students was engineering, with 36 percent of the foreign student total in 1985—more than twice the proportion of the U.S. citizens. The physical, mathematical, and computer sciences also attracted larger proportions of foreign citizens than of U.S. citizens, while the reverse was true for the life, social, and environmental sciences and psychology (chart 13).

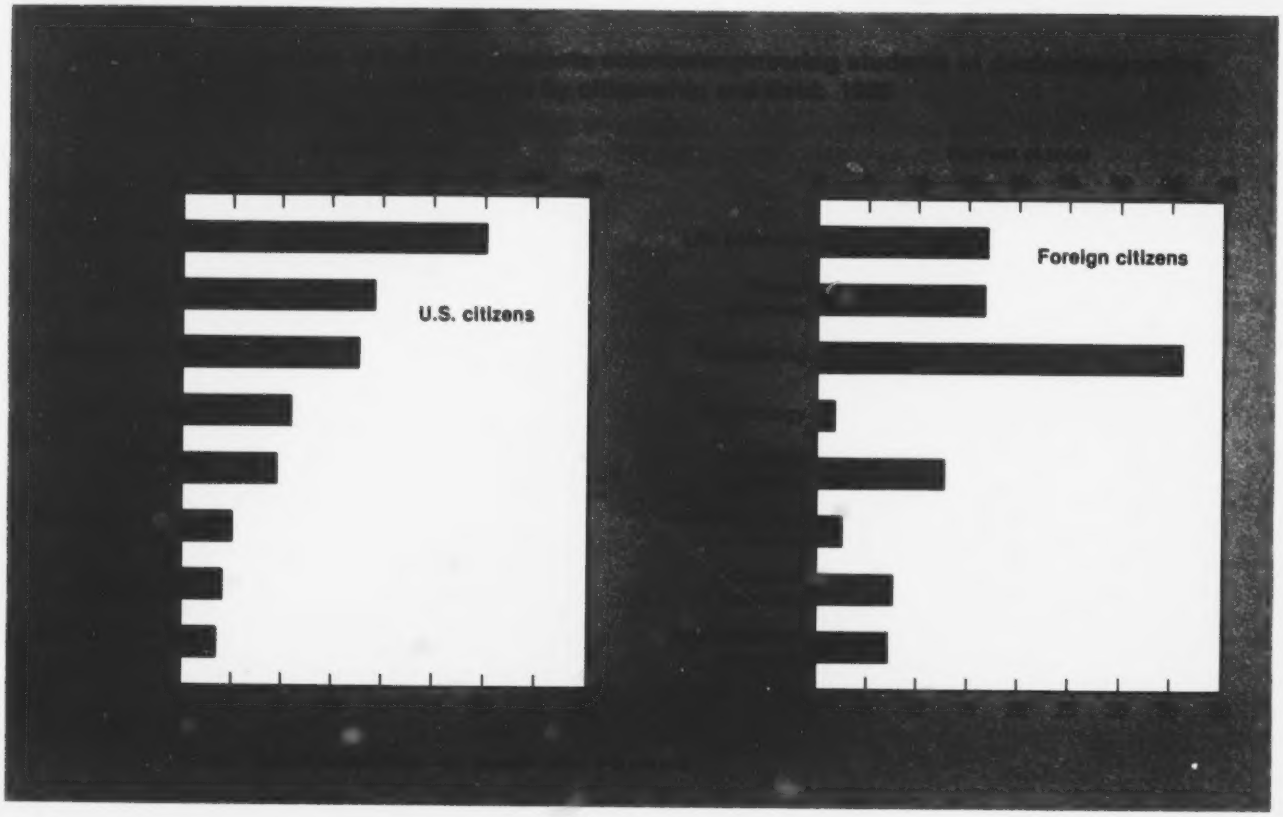
Chart 10. Foreign full-time science/ [illegible]



NOTE: Data were not collected in 1978 by citizenship.
SOURCE: National Science Foundation; appendix tables B-12, B-13, and B-14


Foreign
Total
United States


1977
1985

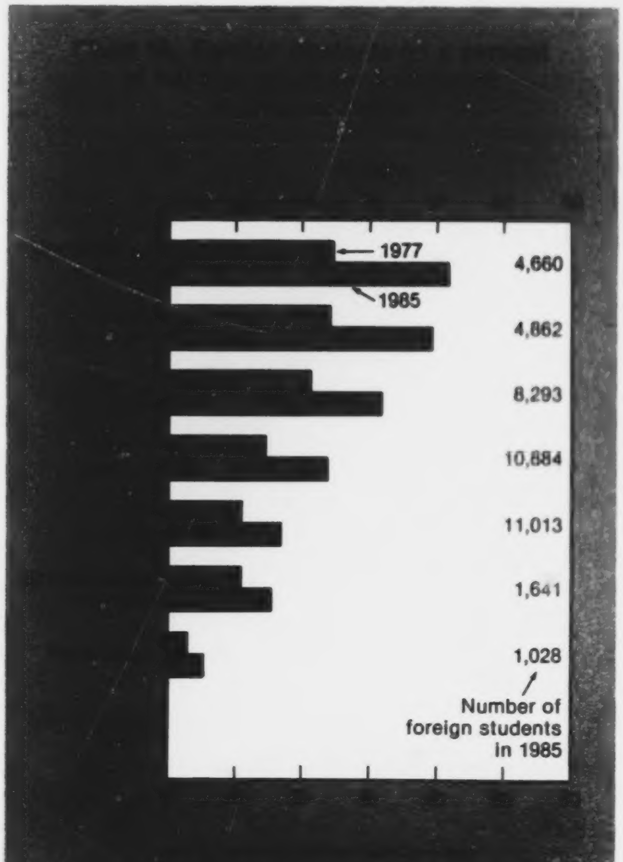

U.S. citizens
Foreign citizens

graduate enrollment in science fields

The general increase in foreign full-time graduate enrollment at doctorate- granting institutions affected every science field between 1979 and 1985. The largest rate of increase was in computer sciences, over 21 percent annually. The number of foreign graduate students in this field increased almost fivefold during the period to a total of 4,900.

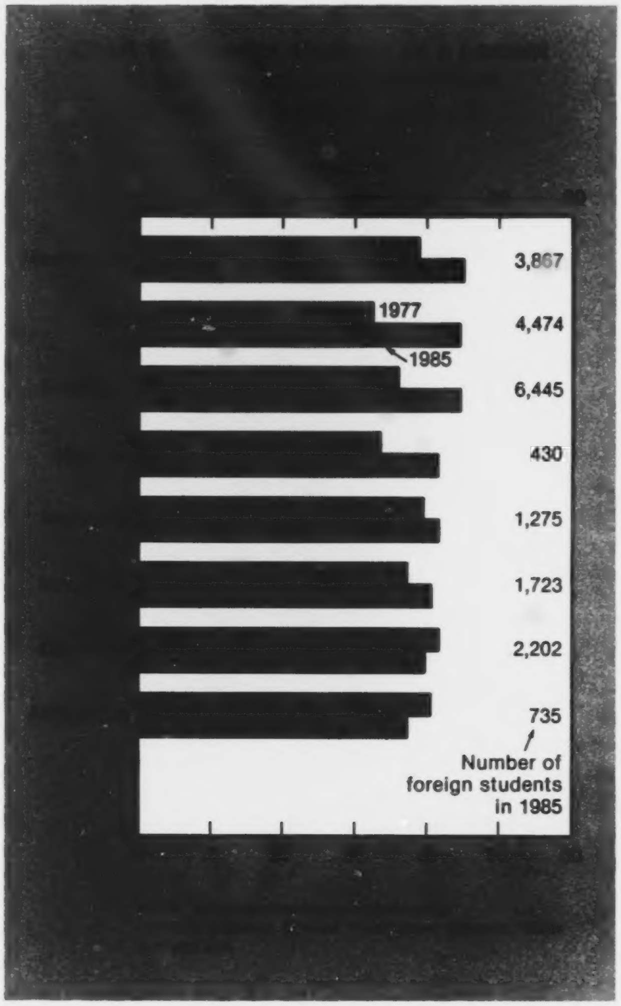
U.S. citizen enrollment decreased slightly in science fields overall. The only field with a large increase for U.S. students was computer sciences, though the 14-percent average annual growth rate for that group was less than the increase for foreign citizens. The popularity of computer sciences among U.S. students is underscored by the rapid growth in baccalaureate awards they earned in this field. Their awards more than quadrupled between 1976 and 1983, from 5,400 to 23,400 awards.

The increases in foreign graduate enrollment, together with decreases in U.S. enrollment in many fields, increased the proportion of foreign students in every science field. By 1985, the highest proportion of foreign graduate student enrollment in the sciences was in mathematical sciences, 42 percent (chart 14). Participation also exceeded one-quarter in the computer sciences, 39 percent, and the physical sciences, where it was nearly 32 percent. Only 5 percent of graduate students in psychology were foreign citizens.



graduate enrollment in engineering fields

The rate of increase in foreign participation in engineering exceeded that for every science field, except the rapidly growing computer science field. The overall changes in foreign enrollment in engineering produced by a 7-percent average annual increase have been cited already. The increases in U.S. enrollment in engineering that have been recorded since 1979 have not been as great, so proportions of foreigners among engineering students have continued to rise. Foreign participation passed 40 percent for six engineering fields, including the three largest in 1985 (electrical, civil, mechanical), exceeding that for the science fields (chart 15).

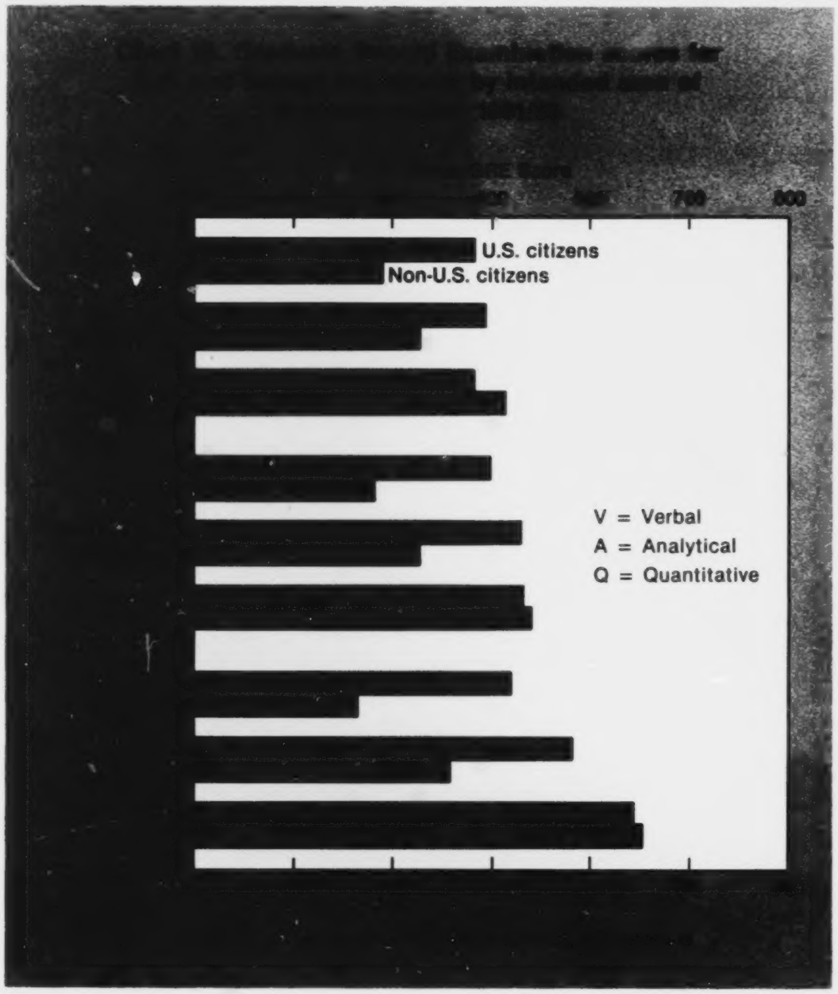


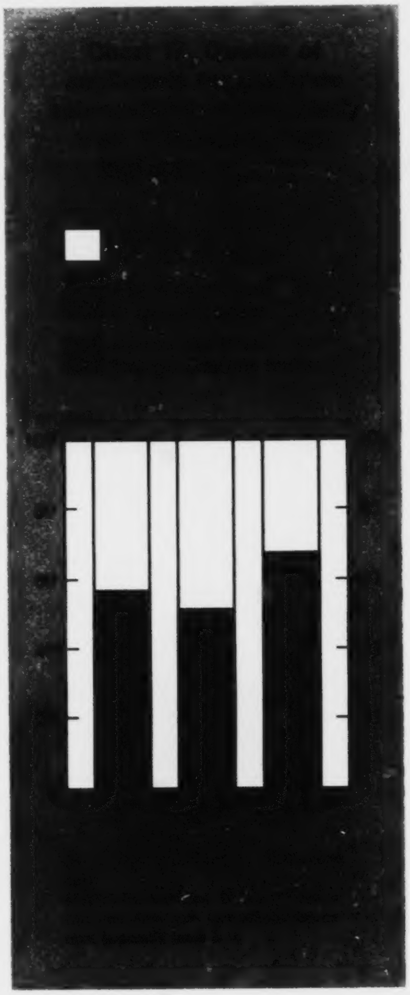
graduate student characteristics and baccalaureate training

The rapid increases in foreign graduate enrollment in S/E fields, accentuated by declining enrollments of U.S. students in some fields, have given rise to numerous concerns about the impact of these foreign students. Their quality, compared to U.S. students, has received considerable anecdotal attention.

Scores of applicants completing the Graduate Record Examination (GRE) permit a comparison of foreign with U.S. students. In 1982, foreign citizens planning for graduate study in S/E fields scored slightly higher on the quantitative sections of the GRE and much lower on verbal and analytic sections than U.S. examinees (chart 16). Differences in primary and secondary languages among examinees probably accounted for the mean group differences of about 120 points for verbal scores. Despite language difficulties, the average quantitative scores for non-U.S. citizens exceeded those of U.S. citizens taking the test by 10 or more points.

More subjective comparisons of student quality have been offered by academic officials. In a survey of opinions of graduate deans conducted in 1982, applicants for graduate education from U.S. universities were generally credited with better qualifications than applicants with foreign baccalaureates (chart 17). Fewer than one-half the graduate deans who were asked to compare the two groups believed them about equally qualified; of the remainder, a much higher proportion favored U.S.-educated students.





Differences in background and experience between U.S. and foreign students have been noted anecdotally,[7] but statistical comparisons are relatively scarce. One study, focusing on doctoral programs in emerging engineering areas, reported that about one-quarter of the programs had to address differences between U.S. and foreign students.[8] Language difficulties of foreign students, both speaking and writing, were noted, as were their lack of laboratory and other "hands-on" experience. Foreigners were credited with strong backgrounds in mathematics, theoretical concepts, and systems.

geographic distribution

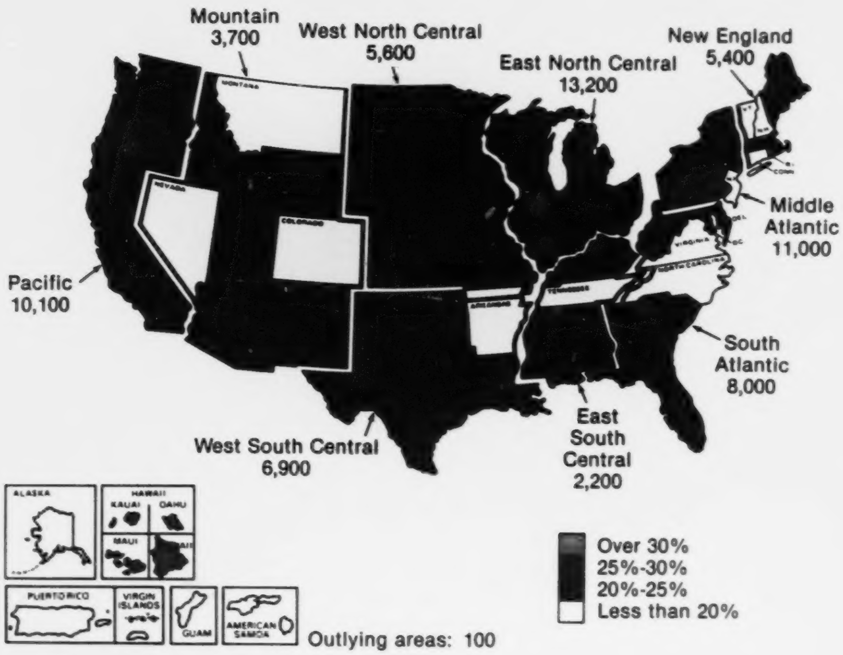
With minor exceptions, the location of foreign full-time graduate S/E students was similar to that of U.S. citizens. Three geographic divisions—the Middle Atlantic, East North Central, and Pacific States—accounted for approximately one-half of both foreign and total full-time S/E graduate students in doctorate institutions (chart 18 and table 3).

California, with two institutions ranked among the top 10 in terms of foreign full-time graduate S/E enrollment, was the leading State in both 1977 and 1985, followed by New York. Texas, which ranked fourth in 1977, had risen to third place by 1985. The 10 leading States combined accounted for almost three-fifths of all the foreign graduate S/E students reported in both years (table 4).

Nine of these 10 States were also in the top 10 in total graduate S/E enrollment, and they accounted for almost the same proportion of total enrollment, 58 percent, compared to 55 percent. In 11 states in 1985, foreign students made up at least 30 percent of total full-time graduate S/E enrollment in doctorate-granting institutions. By comparison, in 1977 there had been only two States in which foreign students exceeded 25 percent of the total.

Chart 18. Foreign as a percent of total full-time science/engineering enrollment in doctorate-granting institutions by state: 1985

Total: 66,100



SOURCE: National Science Foundation

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[7] An extensive synthesis and bibliography is provided by Seth Spaulding and Michael J. Flack, *The World's Students in the United States* (New York: Praeger Publishers, 1976).

[8] *Engineering Programs in Emerging Areas, 1983-84* (Washington, D.C: American Council on Education, Higher Education Panel Report No. 64), September 1985.

Table 3. Geographic distribution of foreign full-time graduate science/engineering enrollment in doctorate-granting institutions: 1977 and 1985

Region	1977		1985	
	Total	Percent distribution	Total	Percent distribution
Total	36,856	100.0	66,109	100.0
New England	3,010	8.2	5,428	8.2
Middle Atlantic	5,692	15.4	11,031	16.7
East North Central	7,592	20.6	13,235	20.0
West North Central	3,211	8.7	5,582	8.4
South Atlantic	4,089	11.1	7,992	12.1
East South Central	1,264	3.4	2,161	3.3
West South Central	3,285	8.9	6,874	10.4
Mountain	1,982	5.4	3,695	5.6
Pacific	6,622	18.0	10,057	15.2
Outlying areas	109	0.3	54	0.1

SOURCE: National Science Foundation

Table 4. Ten leading States in enrollment of foreign full-time graduate science/engineering students in doctorate-granting institutions: 1977 and 1985

Rank	State	1977		1985		Average annual percent change
		Number	Percent distribution	Number	Percent distribution	
	Total, all States	36,856	100.0	66,109	100.0	8.7
	Total, 10 leading States	21,966	59.6	38,234	57.8	8.2
1	California	4,986	13.5	7,567	11.4	6.1
2	New York	3,397	9.2	6,098	9.2	8.7
3	Texas	2,082	5.6	4,510	6.8	11.7
4	Illinois	2,029	5.5	3,493	5.3	8.1
5	Massachusetts	2,258	6.1	3,492	5.3	6.4
6	Ohio	1,719	4.7	3,336	5.0	9.9
7	Pennsylvania	1,651	4.5	3,332	5.0	10.6
8	Michigan	1,827	5.0	2,965	4.5	7.2
9	Wisconsin	1,041	2.8	1,742	2.6	7.6
10	Indiana	976	2.6	1,699	2.6	8.2
	All other States	14,890	40.4	27,875	42.2	9.4

SOURCE: National Science Foundation

institutional distribution

The majority of full-time foreign graduate S/E students have consistently been enrolled in a relatively small number of institutions. In 1985, 41 schools accounted for over 50 percent of the total foreign enrollment. Seven of the 10 leading doctorate-granting institutions, in terms of foreign full-time graduate S/E enrollment, were also among the leading 10 in 1979, indicating considerable stability in the group of schools which were most attractive to foreign students. These top 10 institutions together enrolled 20 percent of all the foreign full-time graduate students in the country and 17 percent of all full-time S/E graduate students (table B-17).

level of department

Foreign students were more heavily concentrated in the doctorate-level S/E departments at doctorate-granting institutions than were U.S. citizens, 90 percent compared to 84 percent, in 1985. This was generally true for individual S/E fields, as well as for the overall totals, with the exception of the computer sciences, in which 79 percent of the U.S. citizens and 72 percent of the foreign citizens were enrolled in doctorate-level departments (table 5). The proportions of both U.S. citizens and foreigners enrolled in doctorate-level departments have remained stable throughout the 1977-85 period.

quality of department

The quality of departments[9] attended by foreign graduate S/E students has been a topic of considerable interest. These students are

Table 5. Total full-time graduate science/engineering enrollment in doctorate-granting institutions by field, citizenship, and level of department: 1985

Field	Total	Doctorate departments	Master's departments	Percent in doctorate departments
Total, all fields	249,666	213,775	35,891	85.6
Engineering	55,997	50,602	5,395	90.4
Science	193,669	163,173	30,496	84.3
Physical sciences	26,065	25,027	1,038	96.0
Environmental sciences	10,918	9,404	1,514	86.1
Mathematical sciences	11,180	9,844	1,336	88.1
Computer science	12,401	9,422	2,979	76.0
Life sciences	66,235	54,734	11,501	82.6
Psychology	21,002	19,385	1,617	92.3
Social sciences	45,868	35,357	10,511	77.1
U.S. citizens, all fields	183,557	154,052	29,505	83.9
Engineering	32,269	28,742	3,527	89.1
Science	151,288	125,310	25,978	82.8
Physical sciences	17,772	17,062	710	96.0
Environmental sciences	9,277	7,863	1,414	84.8
Mathematical sciences	6,520	5,625	895	86.3
Computer science	7,539	5,921	1,618	78.5
Life sciences	55,222	44,691	10,531	80.9
Psychology	19,974	18,418	1,556	92.2
Social sciences	34,984	25,730	9,254	73.5
Foreign, all fields	66,109	59,723	6,386	90.3
Engineering	23,728	21,860	1,868	92.1
Science	42,381	37,863	4,518	89.3
Physical sciences	8,293	7,965	328	96.0
Environmental sciences	1,641	1,541	100	93.9
Mathematical sciences	4,660	4,219	441	90.5
Computer science	4,862	3,501	1,361	72.0
Life sciences	11,013	10,043	970	91.2
Psychology	1,028	967	61	94.1
Social sciences	10,884	9,627	1,257	88.5

SOURCE: National Science Foundation

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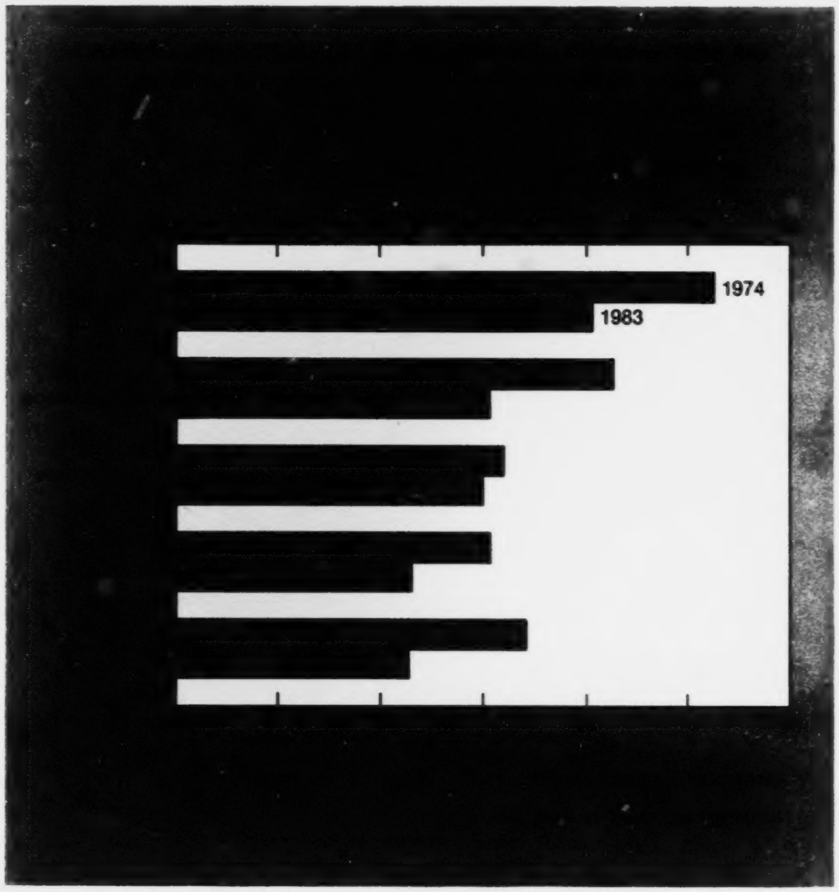
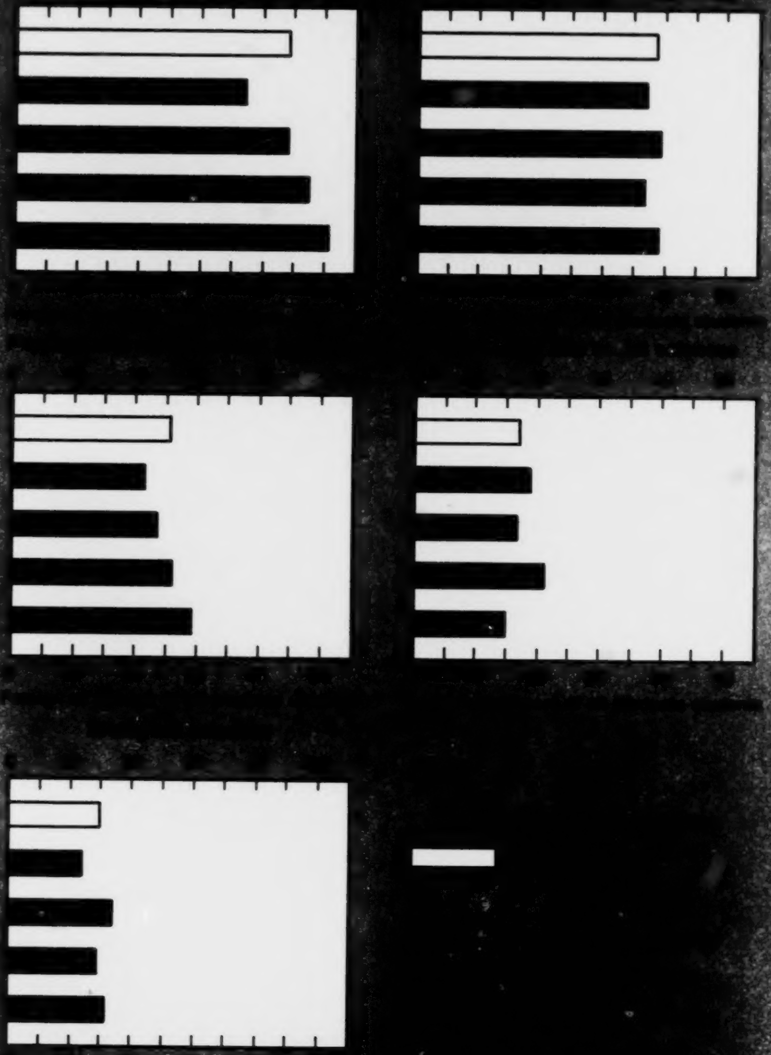
[9] The department quality rankings referred to in this section resulted from a reputational survey of the Conference Board of Associated Research Councils (1981). The findings reported here are based on measure 8: "Mean rating of the scholarly quality of program faculty." See L. Jones, G. Lindzey, and P. Coggeshall (Eds.), *An Assessment of Research Doctorate Programs in the United States* (5 volumes): Engineering, Mathematical and Physical Sciences; Biological Sciences; Social and Behavioral Sciences; and Humanities (Washington, D.C: National Academy Press, 1982). The special analyses linking these ratings with the enrollment statistics presented in this section were conducted by Robert Snyder and the Council of Graduate Schools under a grant from the National Science Foundation.

distributed more evenly now, across S/E departments grouped according to peer ratings of perceived quality, than they were 10 years ago. Whereas 20 percent of the foreign S/E graduate students were in the top-ranked quarter of S/E departments in 1974, only 16 percent were in these departments in 1983. In engineering, the proportion of foreign students enrolled in the top quarter of ranked departments dropped from 26 percent to 20 percent (chart 19).

Foreign enrollments have increased in S/E departments of all quality rankings. The proportions have risen more rapidly, however, in lower-ranked or unrated departments than they have in the highest ranking departments. For example, the proportion of all foreign full-time graduate students who were enrolled in unranked departments of mathematical and computer sciences during the 1974-83 period more than doubled, from 11 percent to 26 percent. The higher-ranked departments in mathematics and computer sciences and in biological sciences reported greater proportions of foreign students than the average in 1974, but had lower proportions than the average by 1983. Regular patterns in the enrollment of foreign students as a percent of all graduate students occur only in the disciplines of engineering and the combined fields of physical and environmental sciences. In these two areas in 1983, higher-ranked departments had lower proportions of foreign students than those with lower rankings. The distribution of foreign students across a wider range of departments could result from arbitrary restriction on foreign student enrollment by a department (limiting the number or proportion of foreign students) or it could reflect the increased availability of quality applicants with U.S. citizenship. Only in psychology and social science did departments with the highest rankings report concentrations of foreign students that were above average (chart 20).





section 3.

foreign recipients of U.S. s/e doctoral degrees

This section examines the trends in S/E doctoral degrees received by foreign citizens, considering the impact of steadily growing numbers of doctorates awarded to foreign citizens and decreasing numbers earned by U.S. citizens. Two items are compared: the sources of financial support for foreign and U.S. doctoral recipients while engaged in graduate study, and postgraduation plans of the foreigners.

Doctoral education in the United States has attracted a growing number of foreign citizens. Since 1981, more than one-half of the engineering doctorates awarded in this country have been to foreign citizens. They also earned nearly 22 percent of the science doctorates in 1985. In some science fields—especially mathematics, computer sciences, and social sciences—about one-third of the awards have been to foreigners. Clearly, U.S. universities are regarded as offering world-class opportunities in many fields. The assumption of a larger role for U.S. graduate education, beyond replenishing the U.S. supply of research scientists and engineers, to becoming the pre-eminent supplier for the world as well, has brought both satisfaction and concern.

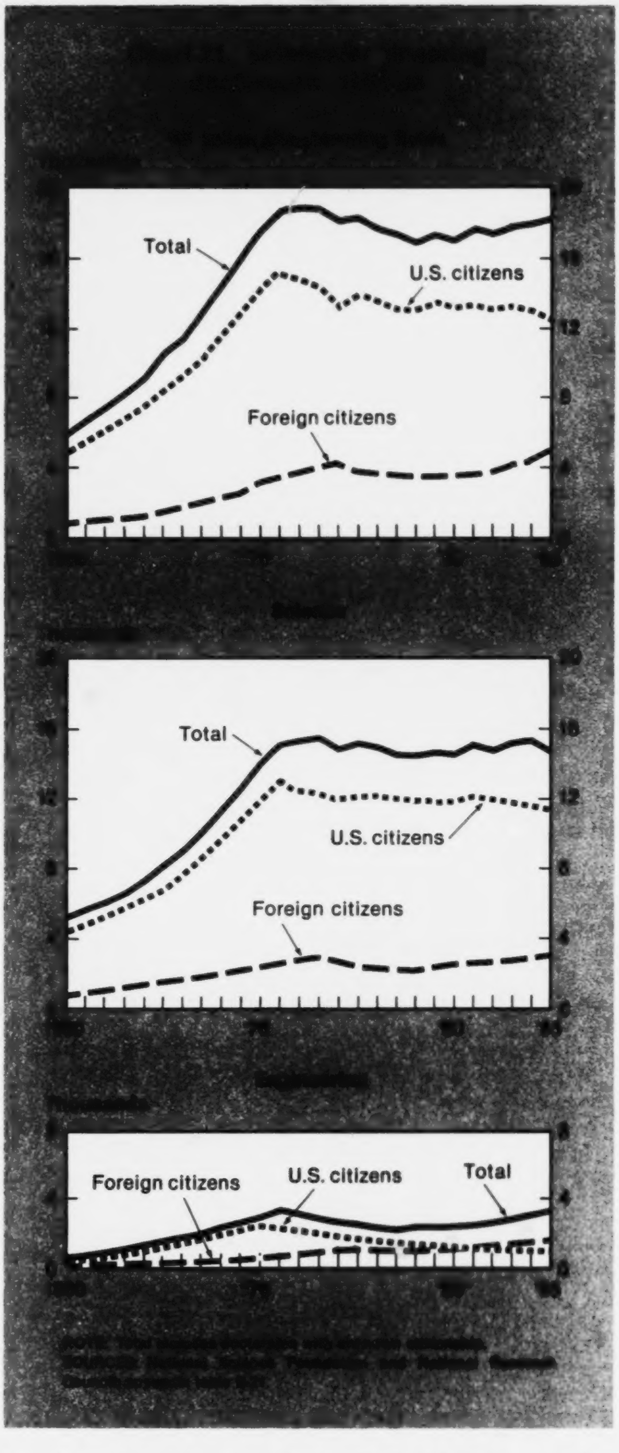
overall trends in doctorate production

There have been three distinct phases in S/E doctorate production by U.S. universities during the 1960-85 period (chart 21). Dramatic growth marked the sixties, the first phase, with increases in awards for both men and women, for both U.S. citizens and non-U.S. citizens, and in all major fields. The U.S. age cohort contributing most doctorates, 25- to 34-year-olds, increased over 10 percent during this period. Demands for faculty in response to burgeoning undergraduate enrollment, as well as the space programs, encouraged S/E study. The number of S/E doctorates awarded annually rose from 6,260 in 1960 to a peak of 19,000 in 1972, an increase of over 200 percent.

During the second phase, which comprised most of the seventies, the total number of S/E doctorates awarded declined each year, to a low of 17,050 in 1978. The onset of declines in the number of awards to male U.S. citizens and fluctuations in degrees to non-U.S. citizens contributed to this decline. Although the size of the age cohort for doctorates continued to increase, concerns about declining employment opportunities in the academic sector and cutbacks in space and other Federal programs made S/E fields less attractive.

During the third and current phase, there has been a slow increase in annual S/E doctorate production in all major fields except mathematics and social sciences. The 7-percent increase from 1978 to 1985 resulted from rising numbers of doctorates awarded to women and non-U.S. citizens that were more than sufficient to offset a continuing decline in awards to male U.S. citizens. Continual growth in the numbers of 25- to 34-year-olds and employment opportunities associated with rising defense expenditures also have been factors in these increases.

The overall trends mask changes in component groups that are in some cases complementary, sometimes contradictory. One trend shared by both U.S. and foreign citizens is the increasing proportion of doctorates earned by women. For U.S. citizens, however, the steady



increase observed since 1960 slowed in the eighties. For foreign citizens also, the proportion of awards to women leveled off about 1980, at levels generally lower than those for U.S. citizens (table B-22). By 1985, women earned 30 percent of the S/E doctorates awarded to U.S. citizens, but less than one-half that proportion (14 percent) of the S/E doctorates awarded to non-U.S. citizens (table 6). Science fields had greater proportions of awards to women than did engineering, though U.S. and non-U.S. women differed in their proportions across science fields. Foreign women on permanent visas had higher representation in biological sciences and mathematics than did either those on temporary visas or U.S. citizens.

Table 6. Percent of doctorates awarded to women by field and citizenship: 1985

Field	Percent women			
	United States	Foreign citizens		
		Total	Permanent visas	Temporary visas
Total, science/engineering	30.0	13.9	20.0	12.5
Physical sciences[1]	16.5	15.0	16.3	14.7
Mathematics	18.6	12.1	28.6	9.2
Computer sciences	12.7	7.1	0.0	9.0
Agriculture	17.6	11.6	14.0	11.3
Biological sciences	32.7	33.4	42.6	31.0
Social sciences and psychology	45.2	22.3	35.7	18.5
Engineering	9.3	4.2	5.4	4.0

[1] Includes earth, environmental, and marine sciences.

NOTE: Based on doctorates with known citizenship.

SOURCES: National Science Foundation and National Research Council

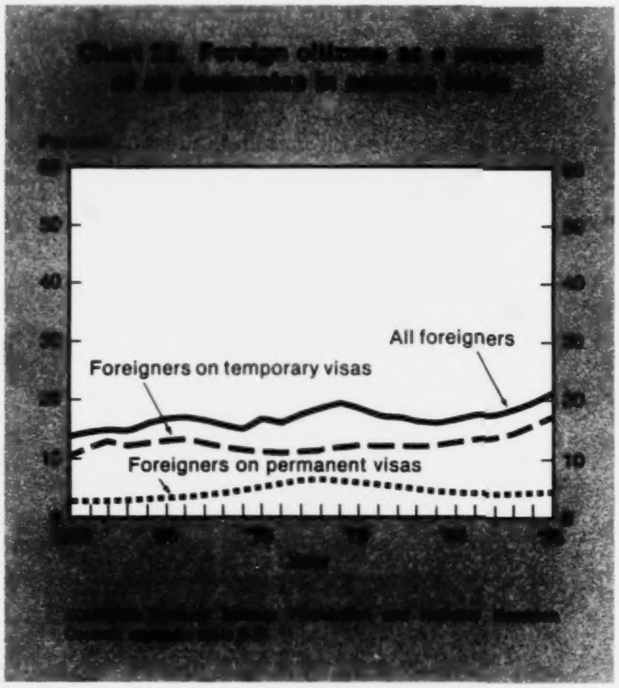


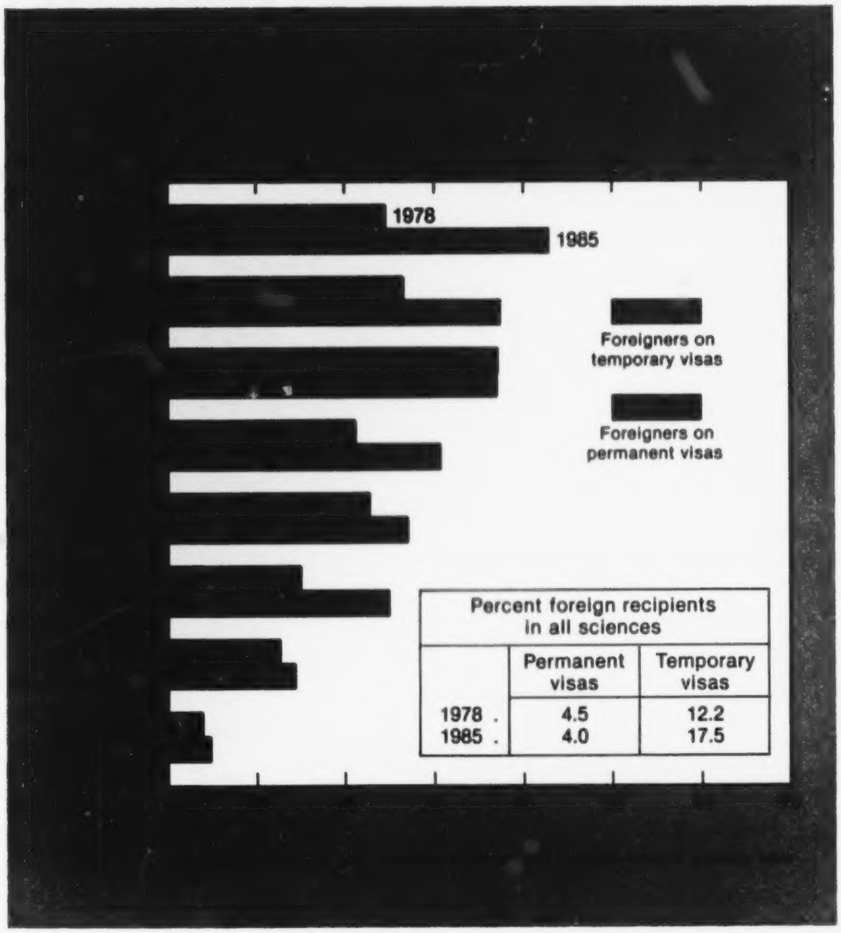
Chart 22. Foreign citizens as a percent of all doctorates in science fields

science fields

Although doctorates awarded to foreign citizens in science fields have generally followed the trend noted for science and engineering overall, the patterns for U.S. and non-U.S. citizens diverged in the eighties. While numbers of awards to U.S. citizens are declining, awards to non-U.S. citizens are showing steady increases. As a result, the proportions of science awards to foreign citizens reached an all-time high of 22 percent in 1985 (chart 22).

The recent increase in foreign awards for six of the eight science fields has been primarily among persons on temporary visas. The fields with the highest proportions of foreign citizens on permanent visas are computer sciences and mathematics, with about 8 percent and 6 percent, respectively (chart 23). In all science fields combined, both the number and the proportion of doctorates awarded to persons with permanent visas has declined.

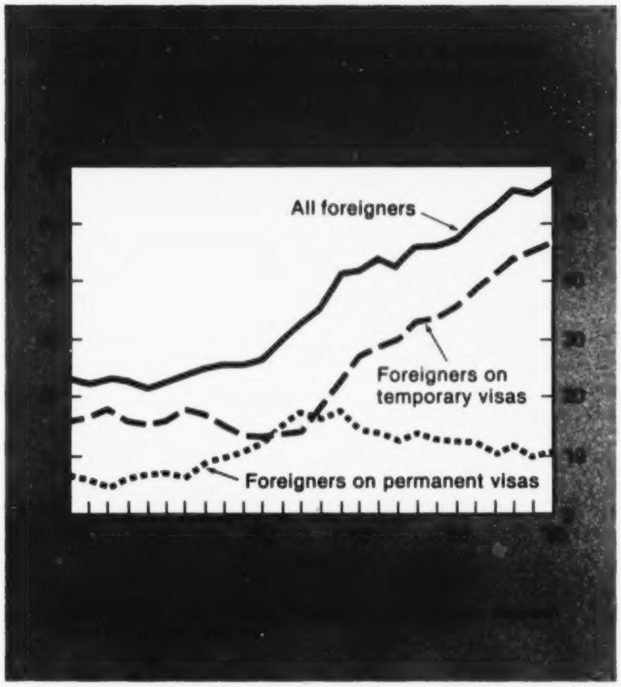
The decline in science doctorates awarded to U.S. citizens is even more dramatic when it is considered in relation to population. For doctorates, the numbers of awards per thousand 30-year-olds in the U.S. population provides a useful reference measure, termed "participation rates" for doctorates. These ratios are used in a later section to examine possible trends. Although the general decline in male participation noted in the early seventies may have resulted in part from a relaxation of the unusually high incentives to continue graduate enrollment during the Vietnam Conflict, the steady decline is continuing through the mideighties. Among U.S. citizens, fewer than half as many doctorates per thousand males were awarded in 1985 as there had been in 1970 (table B-23). Women continued a slow increase in S/E doctorate awards through 1984, then declined slightly in 1985. The increasing numbers for women in the first half of the eighties were not sufficient to compensate for the decreasing participation of men.



Percent foreign recipients in all sciences		
	Permanent visas	Temporary visas
1978 .	4.5	12.2
1985 .	4.0	17.5

engineering fields

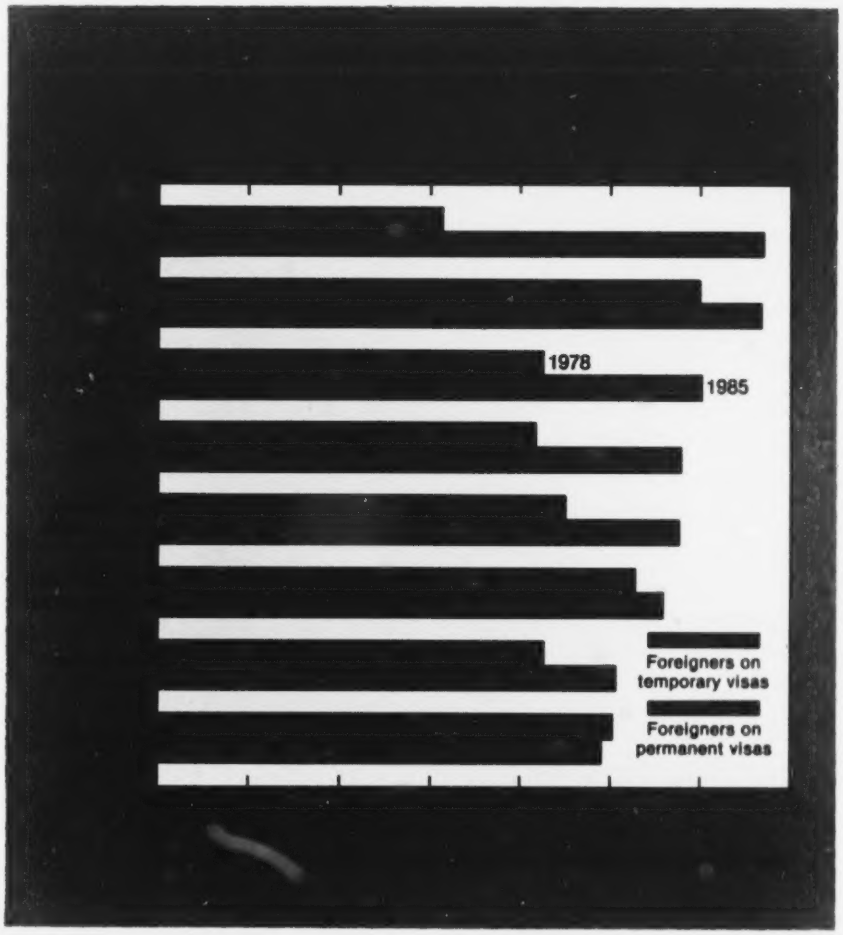
The pattern of foreign participation in engineering differs from that observed in science. Steady increases in numbers of both U.S. and non-U.S. citizens marked the sixties, with the proportion of non-U.S. citizens remaining near one-quarter. In the seventies, the numbers of awards to U.S. citizens began a decline in 1971 which continued nearly unbroken until 1984, while the awards to foreigners steadily increased. The decline in the number of U.S. citizens earning doctorates has been twice as large as the increase in doctorates to foreigners. The effect of these trends has been to substantially more than double the proportion of doctorates in engi-



neering awarded to all foreigners since 1960, raising it to 57 percent in 1985 (chart 24). All of the increase occurred with foreigners on temporary visas; foreigners on permanent visas are earning fewer engineering doctorates than they did in the early seventies.

Foreign citizens earned half or more of the doctorates in the largest engineering fields—electrical, civil, mechanical, chemical—with the greater proportions of those foreigners holding temporary visas (chart 25). These four engineering fields together accounted for 59 percent of all engineering doctorates.

The decline in engineering doctorates among U.S. citizens has been far more severe than the decline noted already in science doctorates. In absolute numbers, doctorates to U.S. males dropped by more than half since 1970. In number of degrees per thousand 30-year-olds, participation remains less than one-third its 1970 level. In 1985, about 55 per 100,000 of the U.S. 30-year-old males received engineering doctorates (table B-25). While the participation rates for women have increased, they started from a base of almost zero and are now about 6 degrees per 100,000 30-year-old females. Reasons for this decline in engineering doctorates to U.S. citizens may include attractive employment offers being made to engineering baccalaureates and slow progress in making the engineering fields of interest to women. Furthermore, it is not clear whether graduate engineering schools are admitting large numbers of foreign students because the foreign students are marginally better qualified than U.S. applicants or because U.S. students are not applying for graduate school.

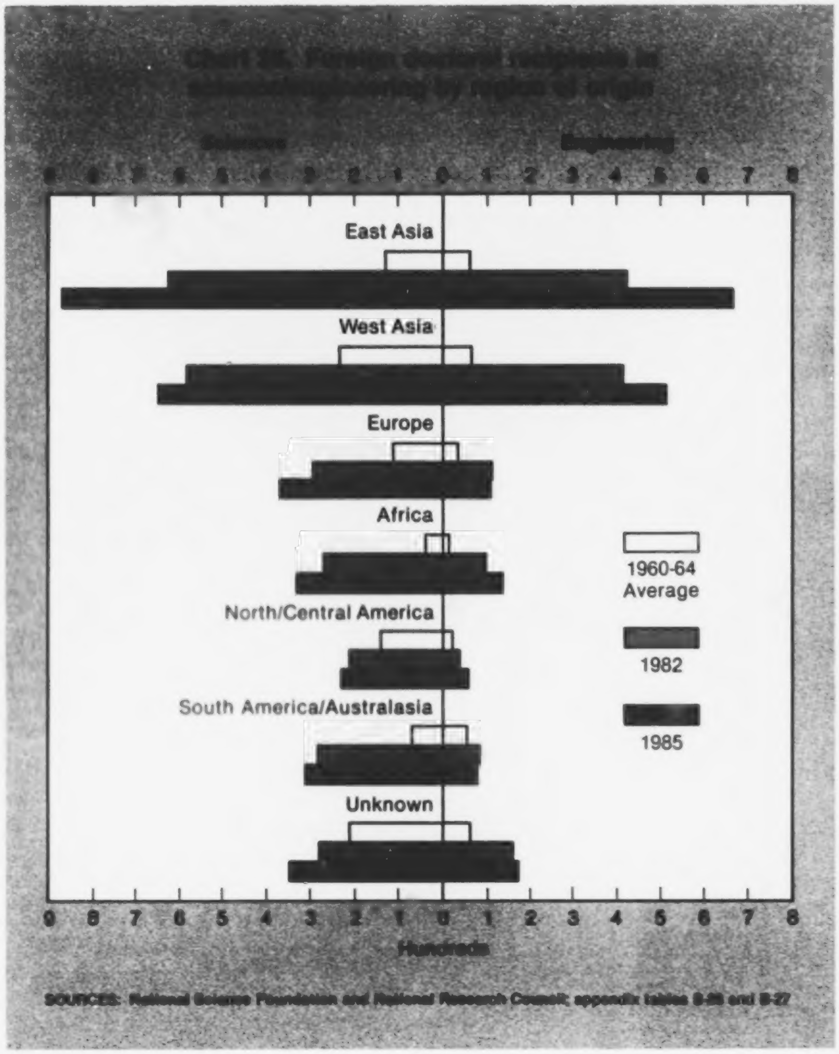


region of origin

Foreign S/E doctorate recipients come from almost every country in the world. East and West Asian recipients, however, have constituted significant portions of non-U.S. recipients since 1960 (chart 26). In science fields, East Asians[10] and West Asians[11] together comprised nearly half of the foreign doctorates in 1985. The proportion from West Asia has changed little since the early sixties, whereas East Asians have increased their participation by nearly 15 percent of the total. The dominance of Asian countries among foreign engineering doctorate recipients is even more striking, rising from almost 50 percent during 1960-64 to nearly 70 percent by 1985. Again, the larger increase was from the East Asian countries. Of the 10 leading countries in foreign recipients of doctorates in 1985, 6 were from Asian regions (table 7). These 10 countries contributed 43 percent of the foreign doctorate recipients in science, and 56 percent in engineering.

By examining individual countries, one can see substantial differences in choices of field among doctorate recipients. Indian science doctorates were heavily concentrated in the physical sciences, whereas Chinese students favored physical and life sciences about equally (table B-28). Life sciences were strongly favored by Canadians and Brazilians, whereas for Nigerians, Iranians, and Koreans, social sciences degrees were more common than life sciences. Similar concentrations were characteristic of doctorates awarded in engineering fields. Electrical/electronics was the most common field for Chinese and Iranian engineering doctorates, but

Chart 26. Foreign doctoral recipients in science/engineering by region of origin



SOURCES: National Science Foundation and National Research Council; appendix tables B-26 and B-27

Table 7. Ten leading countries of origin for foreign recipients of doctorates in science/engineering: 1985

Country of citizenship	Total science/ engineering	Science	Engineering
Total, foreign recipients	4,847	3,119	1,728
Total, 10 leading countries	2,425	1,403	1,017
China (including Taiwan)	792	387	405
India	453	242	211
Korea	316	184	132
Iran	225	109	116
Canada	147	125	22
Nigeria	105	76	29
Egypt	100	54	46
England	99	93	6
Japan, Okinawa, Ryukus Islands	95	70	25
Thailand	93	68	25
Other countries	1,903	1,361	542
Countries not reported	519	350	169

SOURCES: National Science Foundation and National Research Council

its popularity was shared with mechanical engineering by Korean recipients and with civil engineering by Egyptians (table B-29).

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[10] East Asian countries include, among others, China (including Taiwan), Hong Kong, Japan, Korea, and Thailand.

[11] West Asian countries include, among others, India, Iran, Pakistan, Israel, and Turkey.

sources of financial support

Doctorate recipients may receive support from several sources during their years of graduate study; however, their designation of primary source of support is of particular interest. Foreign students are limited in their eligibility for direct Federal programs. They are also at a relative disadvantage in terms of employment because of their temporary status and related visa limitations or language difficulties. Their spouses face similar employment restrictions. Not surprisingly, primary support through research and teaching assistantships was reported more frequently by foreign than U.S. citizens. Family contributions also were a more frequent primary source for foreign than for U.S. citizens. Many non-U.S. citizens with temporary visas relied on "other sources" which, in most cases, was support from their home countries.

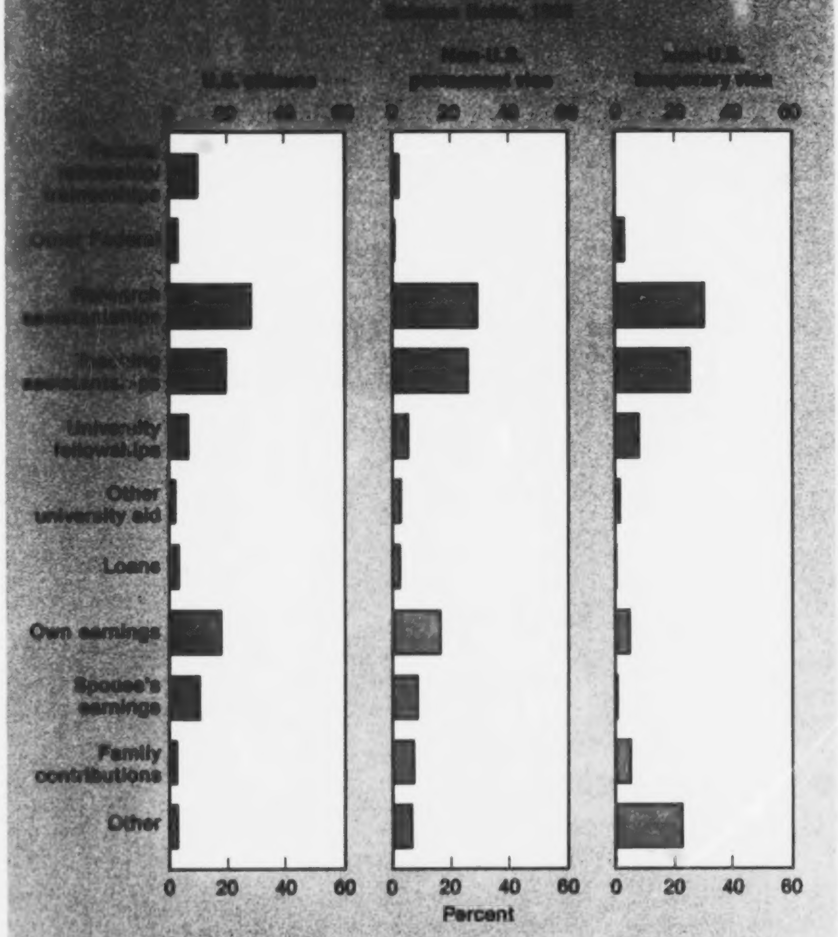
University-related assistance, mainly research and teaching assistantships, figured prominently in the support for foreign students, possibly because many universities assume (albeit informally) some obligation to assist their graduate students throughout the course of their studies. Furthermore, universities are aware of the particular limitations facing foreign students regarding support options. It should be noted that a considerable portion of university-related assistance may be provided from Federal sources, through grants made to accomplish specific research objectives.

Support profiles for science doctorates show that Federal and university-related sources together were the primary sources for about two-thirds of each of the three citizenship groups: U.S. citizens, non-U.S. citizens on permanent visas, and non-U.S. citizens on temporary visas. The non-U.S. citizen groups relied on teaching assistantships more heavily than did U.S. citizens, who could receive direct Federal assistance (chart 27).

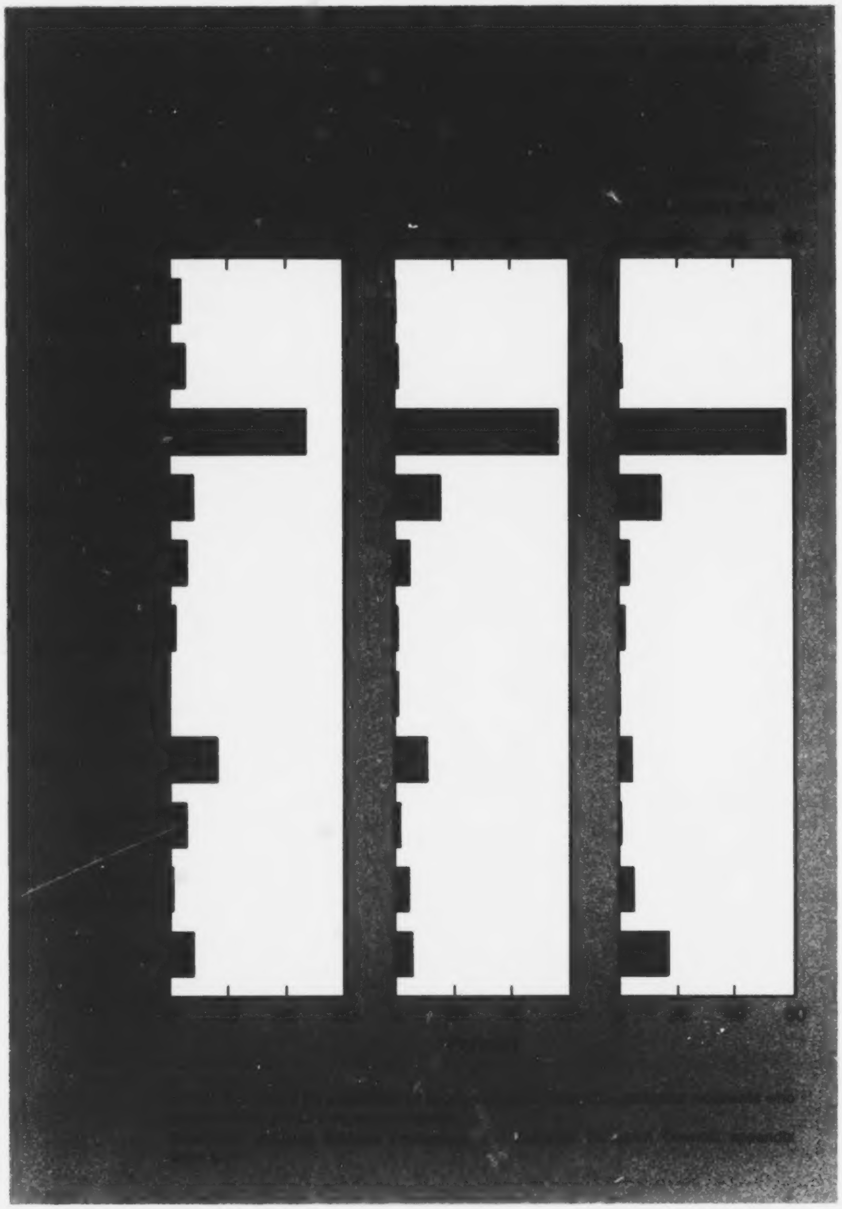
Primary support profiles for engineering doctorates differed markedly from those of the science doctorates for the three citizenship groups. University-related assistance was more frequently cited by each group for engineering than it was for the sciences (chart 28). Federal support was noted by a smaller proportion. University-related assistance accounted for primary sources of nearly 60 percent of the U.S. engineering recipients compared to 75 percent of the non-U.S. recipients. Engineering doctorates were much more likely to have received their university-related support through research assistantships than teaching assistantships.

Chart 27. Primary source of support in graduate school of doctorate recipients by citizenship

Science fields, 1986



NOTE: See tables for explantion of funding sources. Excludes doctorate recipients who did not report primary source of support.
SOURCES: National Science Foundation and National Research Council; appendix table B-30

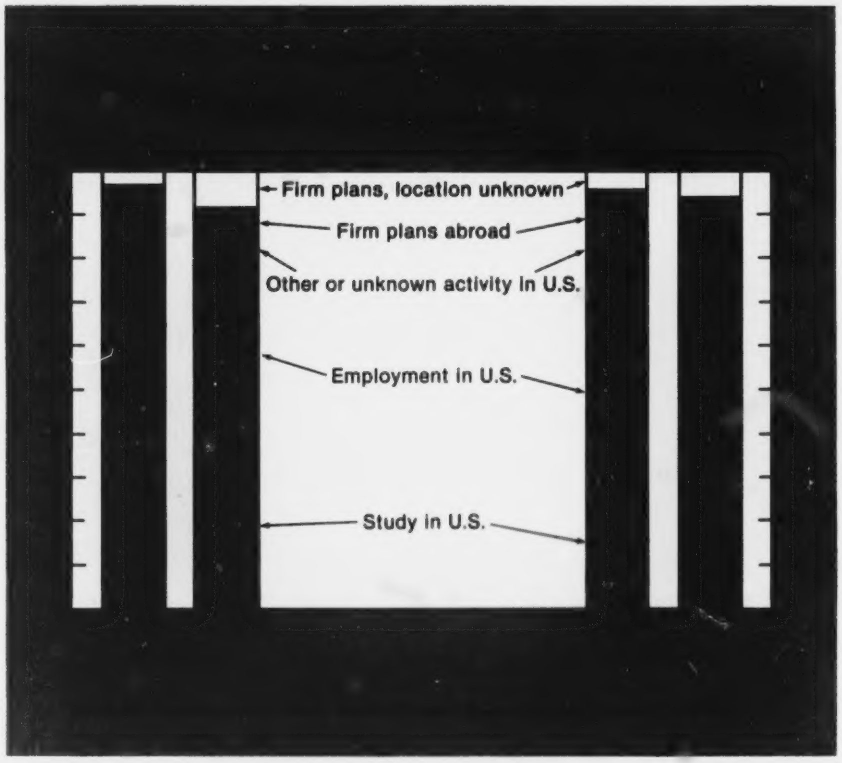


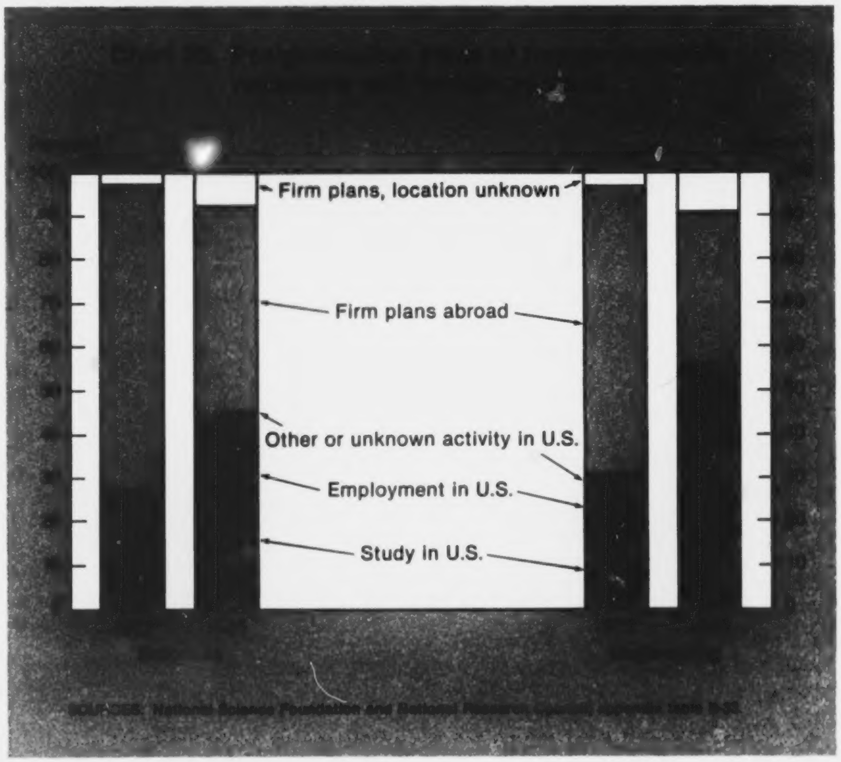
postgraduation plans

Non-U.S. citizens do not necessarily leave the United States upon receipt of the doctorate. Those on permanent visas, which permit them to remain indefinitely in this country and to become U.S. citizens if they so choose, are likely to stay. In 1985, 85 percent of these permanent residents who had firm postgraduation plans at the time of their graduation planned to locate in the United States. In contrast, of those with temporary visas, just under one-half reported postgraduation plans in the United States. The proportions of non-U.S. citizens on temporary visas who stay in this country after receiving S/E doctorates are increasing. It will be seen in the next two sections of this report that these foreign citizens are playing an increasingly significant role in the work force.

It has been noted that persons on permanent visas are comprising a much smaller proportion of the group of non-U.S. citizens receiving S/E doctorates than they did a decade ago. But within this group, the proportions who plan to stay have increased for some S/E fields. For example, in the sciences, those reporting locations in the United States were about 83 percent of those with firm plans in both 1972 and 1985 (chart 29). But those in biological sciences were more likely to stay in 1985 than in 1972 (91 percent compared to 84 percent), as were those in physics and astronomy (89 percent, up from 79). In engineering, there was an increase from 85 percent to 90 percent. It appears that non-U.S. citizens on permanent visas generally can be expected to enter the work force in the United States.

There are much greater increases in proportions of persons on temporary visas who remain in the United States after completing doctorates. In the sciences, the proportion rose from 28 percent to 46 percent between 1972 and 1985 (chart 30). In engineering, the increase for the same period was from 31 percent to 57 percent. These persons primarily are entering employment in the United States. While postdoctoral study has increased among scientists, it has decreased slightly among engineers. Section 5 shows that many of these non-U.S. citizens not only accept employment but eventually convert their visa status from temporary to permanent.





section 4.

academic employment

This section presents information on foreign citizen participation in postdoctoral study and other academic employment, noting also the use of foreign graduate students as teaching assistants. The following section considers academic employment in the larger context of the work force.

Increasing numbers of postdoctorates and teaching and research assistants in college and university S/E departments are foreign citizens. Their presence raises questions about the possible dependence of some fields on non-U.S. citizens to fill key faculty and research posts and the use of foreign students to provide undergraduate instruction.

s/e postdoctorates

Postdoctoral appointments[12] provide opportunities for research activity for doctoral recipients. These appointments carry no academic rank, but persons holding them contribute to academic programs through research they conduct within academic departments, or more directly through lectures or cooperative activities with graduate students. Most appointments have historically been in the biological sciences, health sciences, and physical sciences, which together account for around 85 percent of all S/E postdoctorates. Furthermore, most postdoctorates are appointed at doctorate-granting institutions; 50 or fewer postdoctorates are believed to be working in master's-granting institutions each year.[13] Therefore this analysis is limited to those employed in graduate S/E departments in doctorate-granting institutions.

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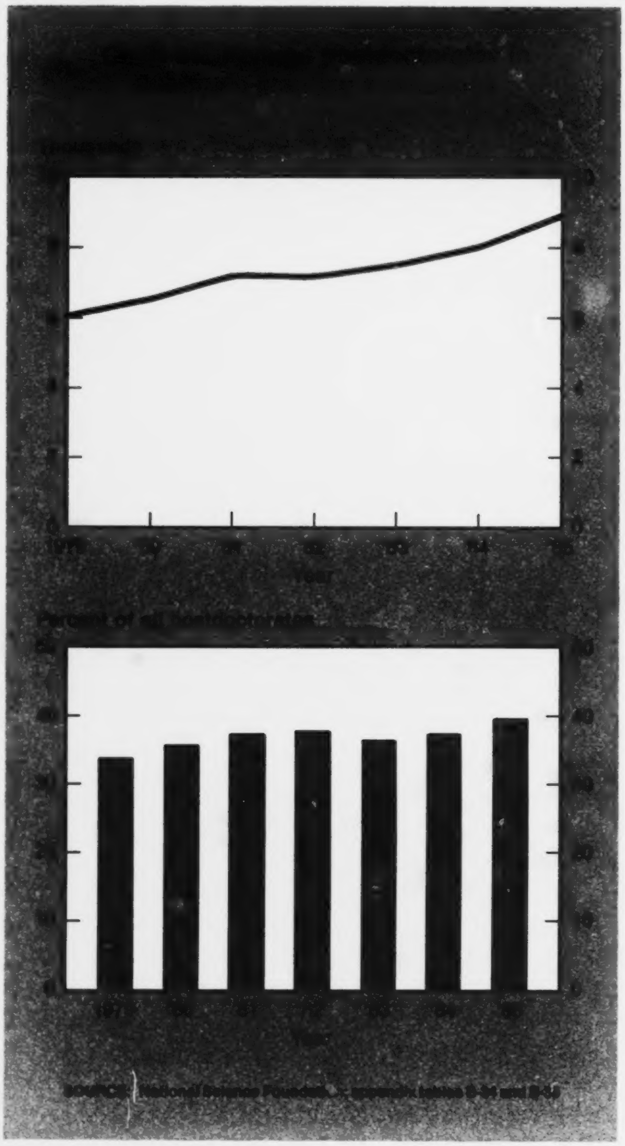
[12] The National Science Foundation defines postdoctorates as "...those individuals with science or engineering Ph.D.'s, M.D.'s, D.D.S.'s, or D.V.M.'s (including foreign degrees that are equivalent to U.S. doctorates) who devote their primary effort to research activities or study in the department under temporary appointments carrying no academic rank. Such appointments are generally for a specific time period. They may contribute to the academic program through seminars, lectures, or working with graduate students. Their postdoctoral activities provide additional training for them." Clinical fellows and those with appointments in residency training programs in the health professions are excluded, unless research training under the supervision of a senior mentor is the primary purpose of the appointment.

Postdoctorates have increased steadily but not dramatically since 1979, reaching nearly 22,700 in fall 1985. The overall rate of increase, 4 percent per year, exceeds that for all graduate students in doctorate-granting institutions. The proportionate change in foreign citizens holding postdoctorates has been slight. Foreign postdoctorates comprised 39 percent of the total postdoctorate employment in 1985, compared to 33 percent in 1979 (chart 31). In some fields, however, foreign citizens made up well over one-half of all postdoctorates (table 8).

The S/E fields with the highest concentrations of foreign postdoctorates were the same as those in which foreign citizens comprised the largest proportions of full-time graduate enrollment. Engineering had the highest proportion of foreign postdoctorates; two of every three engineering postdoctorates in 1984 were non-U.S. citizens.

The role of a postdoctorate varies among S/E disciplines. For example, in biological sciences, a postdoctoral appointment is regarded as an essential additional step in establishing research and professional credentials. Alternatively, it may be related to job market activity and used as an option for temporary employment during the course of an academic job search. Trends in postdoctoral appointments of U.S. citizens would suggest that both of these factors are at work. The number of U.S. citizens holding postdoctorates has increased slightly overall since 1979. The most rapid growth was in the computer sciences (table B-35). Declines have occurred in the social sciences.



SOURCE: National Science Foundation, appendix tables B-34 and B-35

In contrast to the trends for U.S. citizens, the number of foreign citizens holding postdoctorates has risen in all broad fields, although the increases are small numerically in many fields and smaller than those for foreign graduate students (table B-34). The numbers of foreign postdoctorates could increase in the future, as those foreign citizens who are now graduate students complete doctorates. An alternative argument could be advanced, however, that the widening range of employment opportunities for foreign citizens holding doctorates (including those on temporary visas) will make postdoctorate appointments less appealing.

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[13] Data on master's degree-granting institutions were obtained through a sample survey after 1983. Hence, data on postdoctorates from these institutions cannot be provided for later years.

Table 8. Foreign as a percent of total postdoctorates employed in doctorate-granting institutions by field: 1985

Field	Total post-doctorates	Foreign post-doctorates	Percent foreign
Total, all fields	22,691	8,959	39.5
Engineering	1,364	919	67.4
Science	21,327	8,040	37.7
Physical sciences	4,517	2,501	55.4
Environmental sciences	375	125	33.3
Mathematical sciences	231	114	49.4
Computer sciences	74	29	39.2
Life sciences	15,264	5,090	33.3
Agricultural sciences	357	142	39.8
Biological sciences	9,284	3,231	34.8
Health sciences	5,623	1,717	30.5
Psychology	498	54	10.8
Social sciences	368	127	34.5

SOURCE: National Science Foundation

geographic distribution of postdoctorates

The geographic distribution of foreign postdoctorates was similar to that of foreign full-time graduate S/E enrollment. All of the five leading States in postdoctorate employment were also among the top five in full-time foreign enrollment. California, which ranked first on both criteria, includes 5 of the 10 leading institutions. The 10 leading States accounted for two-thirds of the foreign postdoctorates in the country in both 1979 and 1985 (table 9). Twelve States, plus the District of Columbia and the Outlying Areas, had a majority of foreign citizens among their total 1985 postdoctorate employment. Nineteen others had foreign proportions of 40 to 50 percent (chart 32).

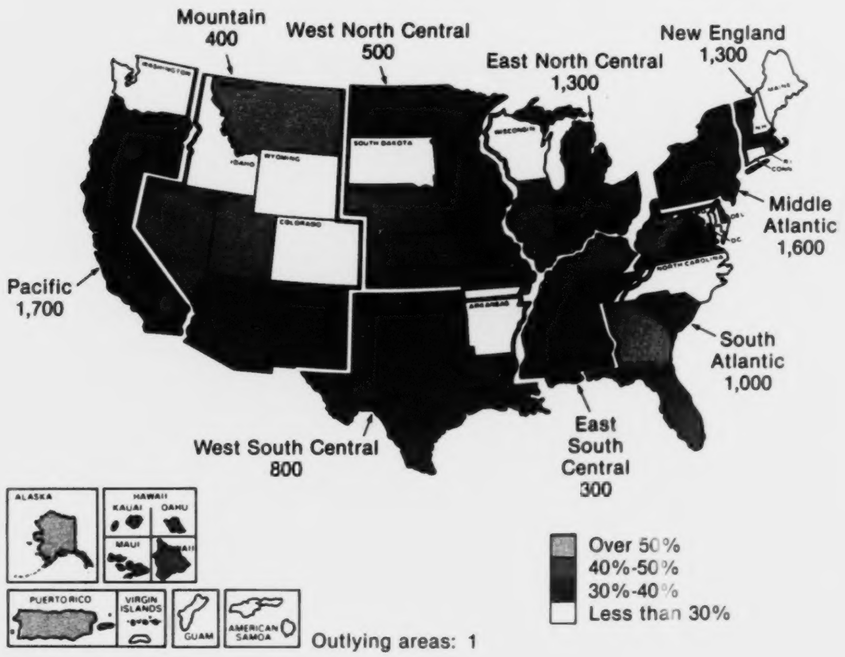
Table 9. Ten leading States in employment of foreign science/engineering postdoctorates in doctorate-granting institutions: 1979 and 1985

	State	1979 number	1985 number	Average annual percent change
	Total, all States	6,054	8,959	6.8
	Total, 10 leading States	4,121	5,916	6.2
1.	California	1,108	1,465	4.8
2.	New York	756	990	4.6
3.	Massachusetts	572	932	8.5
4.	Texas	403	663	8.7
5.	Illinois	314	472	7.0
6.	Pennsylvania	289	413	6.1
7.	Connecticut	156	256	8.6
8.	Ohio	208	254	3.4
9.	Indiana	155	238	7.4
10.	Maryland	160	233	6.5
	All other states	1,933	3,043	7.9

SOURCE: National Science Foundation

Chart 32. Foreign as a percent of total postdoctorates at doctorate-granting institutions: 1985

Total foreign postdoctorates: 9,000



SOURCE: National Science Foundation

foreign students employed as teaching and research assistants

Foreign graduate students in science and engineering are often employed as instructors or as teaching assistants working cooperatively with senior faculty in undergraduate courses. Information is not available to show either the extent to which graduate students serve the instructional function in universities overall, or the proportion of those teaching assistants who are foreign citizens. From the statements of financial support made by doctoral recipients, it is possible to make some examination of differences in *primary* sources of support.

Large numbers of 1985 S/E doctorate recipients listed teaching assistantships as their primary source of support during graduate study. Their distribution across citizenship groups was markedly different for sciences and engineering. In the sciences, U.S. citizens with teaching assistantships outnumbered non-U.S. citizens on temporary visas, about 1,900 to 450. In engineering the reverse was true; non-U.S. citizens on temporary visas outnumbered U.S. citizens, 125 to 100. (See charts 27 and 28 in section 3 and reference appendix tables.)

The differential contributions of S/E graduate students to research have already been cited in discussions of sources of support. In the case of research assistantships, it is notable that, despite the much larger number of doctorates in sciences than in engineering, the number of foreign citizens on temporary visas citing research assistantships as their primary source was larger for engineering (over 600) than for science (under 550).

The largely anecdotal literature discussing foreign students as teaching assistants cites various problems arising from the perspectives of both the foreign students and the undergraduates receiving instruction.[14]

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[14] For a comprehensive collection of articles addressing "the problem, the programs, and the progress" see *Foreign Teaching Assistants in U.S. Universities*, Kathleen M. Bailey, Frank Pialovski, and Jean Zukowski/Faust (Editors)(Washington, D.C.: National Association of Foreign Student Affairs, 1984.

section 5.

scientists and engineers from abroad in the U.S. work force

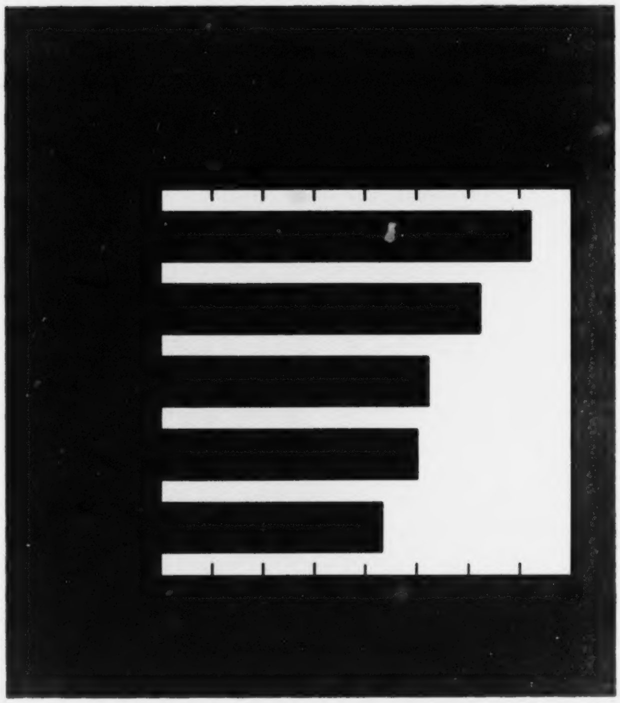
This section reviews the increasing importance of foreign-origin scientists and engineers to the U.S. work force. A significant proportion of private industries report hiring non-U.S. citizens to fill S/E jobs. This section notes the growing importance of these persons, particularly those with Ph.D.'s, during the past decade. The effects of U.S. immigration policy in regulating the number of persons of foreign origin permitted to remain in S/E jobs on a temporary basis or to receive permanent visas are demonstrated.

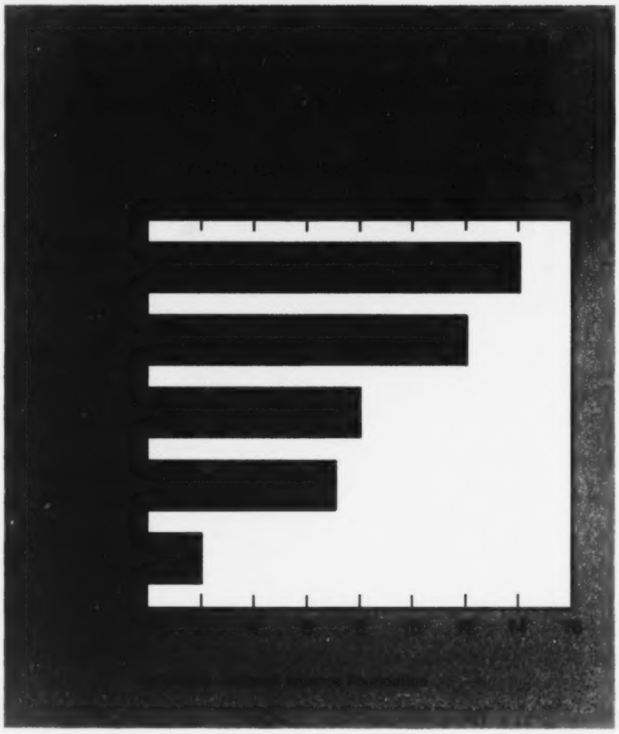
The United States has traditionally relied on foreign-born as well as native-born persons to maintain a strong work force. Foreign-born persons continue to play a major role in S/E employment. Many persons who are now U.S. citizens entered the United States with "temporary-" rather than "permanent-immigrant" status. After working in the United States, they obtained an adjustment to their visa status. Therefore, data on persons with both temporary and permanent visas must be examined to accurately measure the importance of foreign citizens. If the number of temporary entrants and/ or the naturalization rate increases, the United States might experience an increased dependence on inflows of foreign scientists and engineers, but this increase would not necessarily be observable from data on foreign citizens admitted as immigrants.

hiring by u.s. employers

Information on the hiring of foreign citizens by U.S. employers is limited. The only available data are those obtained in June 1985 through a sample survey of firms. One-half of the 305 companies responding to that survey reported that foreign citizens and naturalized U.S. citizens together accounted for one-fifth of their S/E employment.[15] The proportion of foreign and naturalized persons was substantially higher in computer and electronics firms where they constituted 30 percent of the respondents' work force (chart 33).

An average of 8 percent of all scientists and engineers hired by these responding firms between June 1984 and June 1985 were foreign citizens (chart 34). The proportion was above average in companies manufacturing electronic components, computers, and communications equipment (14 percent) and in independent research and development (R&D) laboratories (12 percent). The only other industry with firms reporting foreign citizens at more than 4 percent of hires was chemicals/drugs (7 percent). Most respondents stated that no changes were expected in their hiring practices of foreign citizens during the next 12 months.





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[15] In June 1985, NSF conducted interviews with executives in 305 companies employing scientists and engineers. Of the firms responding, 108 were "Fortune 500" companies. Firms responding were in the following industries: Aerospace, chemicals/drugs, electronics communications equipment, electrical machinery, engineering and architectural services, primary and fabricated metal, mining, office equipment, computers, petroleum refining and extraction, nonelectrical machinery, transportation equipment, and commercial (independent) R&D laboratories. The firms surveyed were not part of a statistical sample; therefore, the data are not weighted to represent national estimates. See National Science Foundation, "Survey of U.S. Firms Finds One-half Employ Foreign Scientists and Engineers," *Science Resources Studies Highlights*, NSF 85-336 (Washington, D.C., February 28, 1986).

foreign students staying in the united states

Foreign citizens receiving doctorates in the United States presently are playing an important role in filling the demand of the U.S. labor market for new entrants. The numbers of foreign origin doctoral scientists and engineers in the work force would not be possible unless a large share of foreign students studying in the United States remained in this country to work.[16] Of the 1980 and 1981 foreign citizens receiving S/E doctorates, about 60 percent of the engineers, over 50 percent of physical and mathematical scientists, and 40 percent of other scientists remained to work in the United States (table 10). Because of their high proportions of total new doctorates and their high rates of postgraduate employment in the United States, foreign citizens ranged from 8 percent of all new doctoral entrants to the labor force in the life sciences to 36 percent in engineering and computer science. Similarly, high proportions of non-U.S. bachelor's and master's graduates in science and engineering remain to work in the United States. Because of their smaller share of total U.S. degrees, they comprise smaller fractions of the new entrants to the S/E work force at these degree levels (table 11).

Table 10. Foreign doctorate recipients in science/engineering, 1980-1981, employed in the United States: 1982

Ph.D. degree field	Percent staying in the United States	Percent of all new Ph.D. entrants to the labor force
Engineering and computer sciences	62	36
Physical sciences and mathematics	56	15
Life sciences	40	8
Social sciences (including psychology)	40	6

SOURCE: Oak Ridge Associated Universities, based on data from the National Science Foundation and special tabulations from the Social Security Administration

Table 11. Proportion of foreign citizens earning B.S. and M.S. degrees in science/engineering, 1976-1979, who were employed in the United States: 1982

	B.S. and M.S. combined	
Degree field	Percent staying in the United States	Percent of all new B.S./M.S. entrants to the labor force
Mathematics and computer sciences	84	9
Physical sciences	45	4
Engineering	54	10
Life sciences	38	2
Social sciences	21	1

NOTE: These estimates exclude graduates who were non-employed, e.g., students in 1982.

SOURCE: Oak Ridge Associated Universities, based on data from the National Science Foundation

A significant share of the scientists and engineers of foreign origin now in the work force were students here. About 80 percent of the increase in foreign origin scientists and engineers between 1972 and 1982 consisted of persons who were S/E students in the United States. Of the 1982 stock of foreign origin scientists and engineers, the proportion who came to the United States after the age of 15 and later entered the work force was about 80 percent of the total; this compares to less than 60 percent of the 1972 total. This increase in the age at entry of immigrants between 1972 and 1982 implies that nearly all the foreign origin scientists and engineers added to the S/E work force since 1970 were persons who came to the United States after the age of 15.

composition of the u.s. work force

The participation of persons of foreign origin in the work force is increasing. Even with substantial increases in the size of the work force between 1972 and 1982, the *proportion* of the United States S/E workforce who were foreign citizens or naturalized citizens increased from 10 percent to 17 percent (chart 35). The increases occurred in the share of the work force who were naturalized. These naturalized citizens were only 9 percent of the employed petroleum engineers in the country, but 18 percent of employed civil engineers (table B-37). Foreign citizens (irrespective of their visa status) comprised only 1 percent of many

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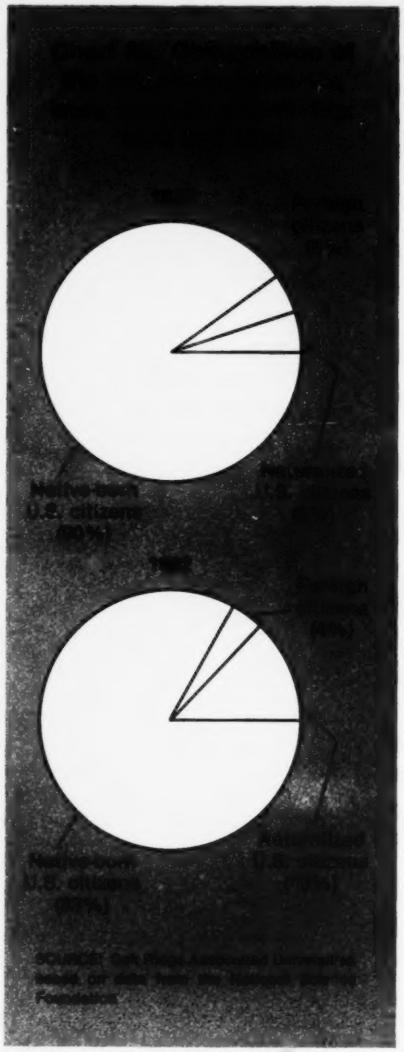
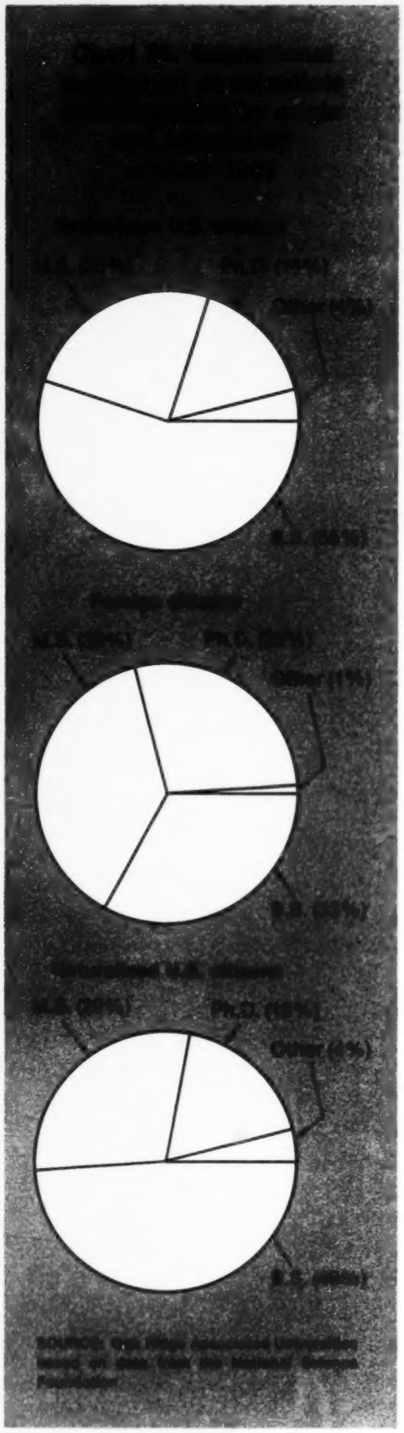
[16] The data in this section deal exclusively with persons who met the NSF criteria to be included as scientists or engineers and who were employed in a S/E occupation at the time of the survey in 1982. The analyses of foreign students remaining in the United States and of the composition of the U.S. work force are drawn from a special report by Michael G. Finn, *Foreign National Scientists and Engineers in the U.S. Labor Force, 1972-1982*, Oak Ridge Associated Universities (Oak Ridge, Tennessee, June 1985), supported by the National Science Foundation. Details on how the estimates were derived are in the report.



SOURCE: Oak Ridge Associated Universities based on data from the National Science Foundation.



SOURCE: Oak Ridge Associated Universities based on data from the National Science Foundation.

S/E occupational groups in 1982, and had the highest representation among materials engineers, where they were 8 percent of those employed (table B-38).

The foreign citizens in the S/E work force were more likely to hold advanced degrees than were U.S. citizens (chart 36). This is a reflection of the fact that in recent years most foreign origin scientists and engineers were educated in U.S. universities and that, as a percentage of the student body, foreign students have been much more prevalent in advanced-degree programs than in bachelor's degree programs.

Foreign citizens differ significantly from U.S. citizens (both native and naturalized) in their type of employer (chart 37). Foreign citizens generally are not employed by the U.S. military and very few work in civilian jobs for the U.S. Government or in State government jobs. Though private industry hires foreign citizens to about the same degree as the average of all employers (13 percent), higher education institutions, hospitals, and other nonprofit employers hire above average proportions. It appears, however, that employment patterns adjust when foreigners have been in the United States a longer time and become naturalized U.S. citizens. For example, the United States military employs naturalized U.S. citizens in almost the same proportion as do all employers.

The primary work activity for scientists and engineers from abroad gives insight into the distinct contributions being made by this group. Not surprisingly, those of foreign origin are underrepresented in management and are overrepresented in research (chart 38). This is partly a reflection of the fact that the foreign citizens in the S/E work force tend to be younger than the average U.S. scientist or engineer. There is not a heavy concentration of immigrants in teaching. Though there are more foreign origin teachers than there were in 1970, they constitute a smaller proportion of scientists and engineers who report that teaching is their primary work activity than they do of all scientists and engineers. Foreign born teachers increased in absolute terms since 1970 as a result of the general growth in the size of the work force. They were concentrated in educational institutions—without having been concentrated in teaching—because they were often engaged in research in a university or medical school.

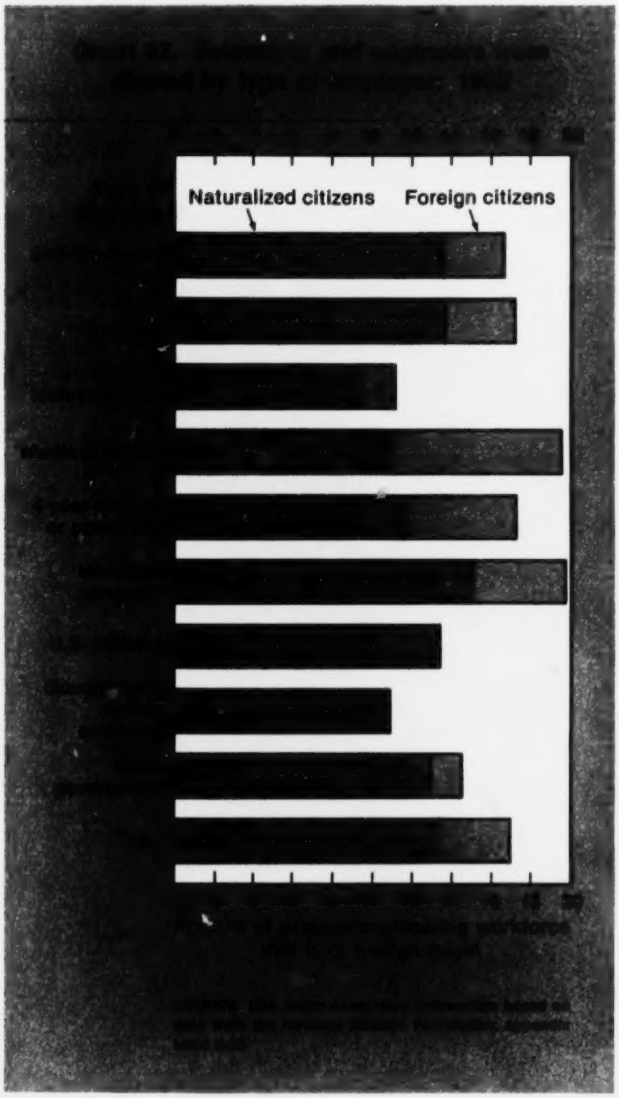


Chart 27. Scientists and engineers from abroad by type of employer: 1982

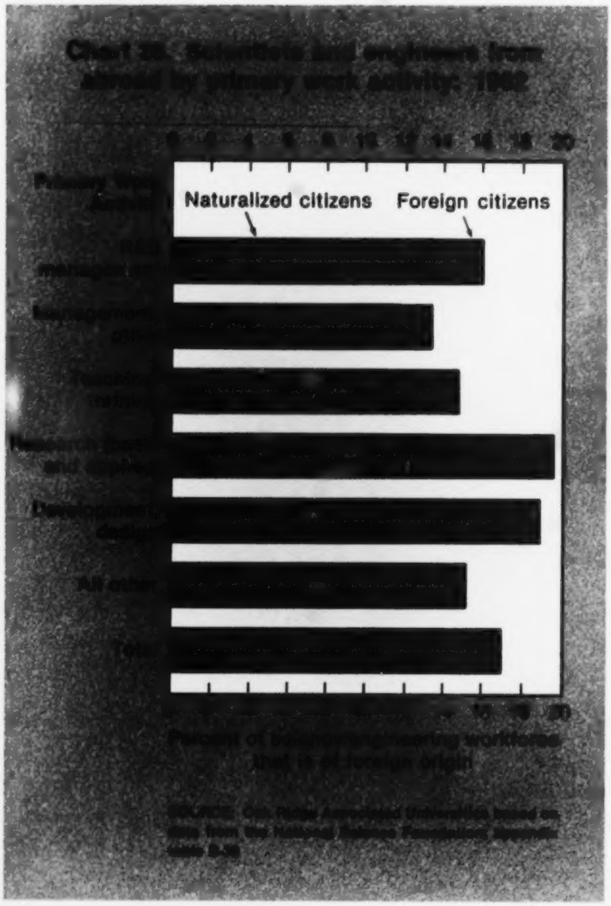


Chart 28. Scientists and engineers from abroad by primary work activity: 1982

u.s. immigration policy

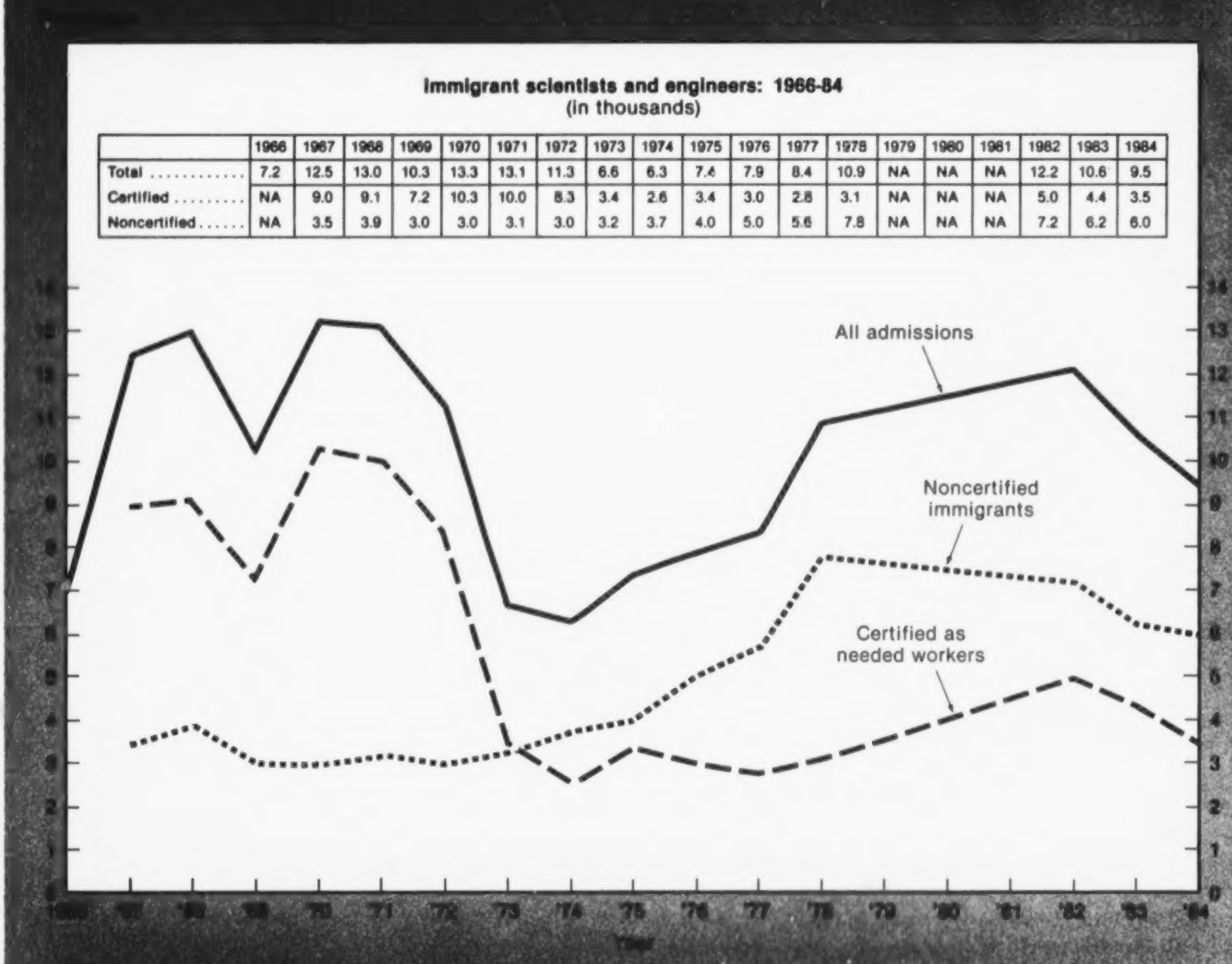
The high utilization of foreign origin scientists and engineers in the U.S. work force focuses attention on the process by which foreign citizens enter this country and, in many cases, become naturalized. U.S. immigration laws and regulations have had a major bearing on the levels and participation of foreign citizens in the U. S. labor force.

The Immigration and Nationality Act of 1952, as amended, is the basis of current U.S. immigration policy. Immigration for permanent residence in the United States is limited to 290,000 in any year with a maximum of 20,000 for any one country. This act also provides for admission outside of these limitations of spouses of U.S. citizens and certain special immigrants such as refugees. About 80 percent of the quota is reserved for persons related to U.S. citizens or permanent-resident immigrants. Other would-be immigrants must compete for the remainder of the preference quotas on the basis of having occupational skills needed in the United States because of an insufficient supply of domestic workers. The Secretary of Labor must "certify" that these immigrants will not adversely affect the wages or working conditions of similarly employed workers.

In addition to the permanent resident immigration discussed above, the Act also permits foreign citizens to be in this country to work for temporary periods. There are no quota limitations for such temporary visas. In 1978 (the last year such data are available) scientists and engineers with temporary visas comprised 30 percent of all scientists and engineers admitted from abroad. Temporary visas are granted for one-year extendable periods to persons in the professions with no certification required by the Department of Labor. Foreign students, upon graduation, may be granted up to one year of residence for work providing practical training. With some exceptions, scientists and engineers employed in the United States on temporary visas are eligible to adjust status to permanent resident immigrants. In particular, former students, after completion of their year of practical training, may be eligible to adjust status to permanent residence or apply for other types of temporary visas, thereby extending their stay in the U.S. work force.

The changes in the immigration law have affected the levels and composition of immigration for scientists and engineers. Immigration of scientists and engineers admitted for permanent residence rose sharply between 1966 and 1971 because of revisions in the law allowing greatly expanded entry from Asian countries (chart 39). The sharp decline between 1971 and 1975 and subsequent movements through 1984 reflect changes in regulations, making immigration of persons seeking entry as professional and skilled workers dependent on U.S. labor market conditions.

Chart [illegible]. Immigrant scientists and engineers by type of admission: 1966-84

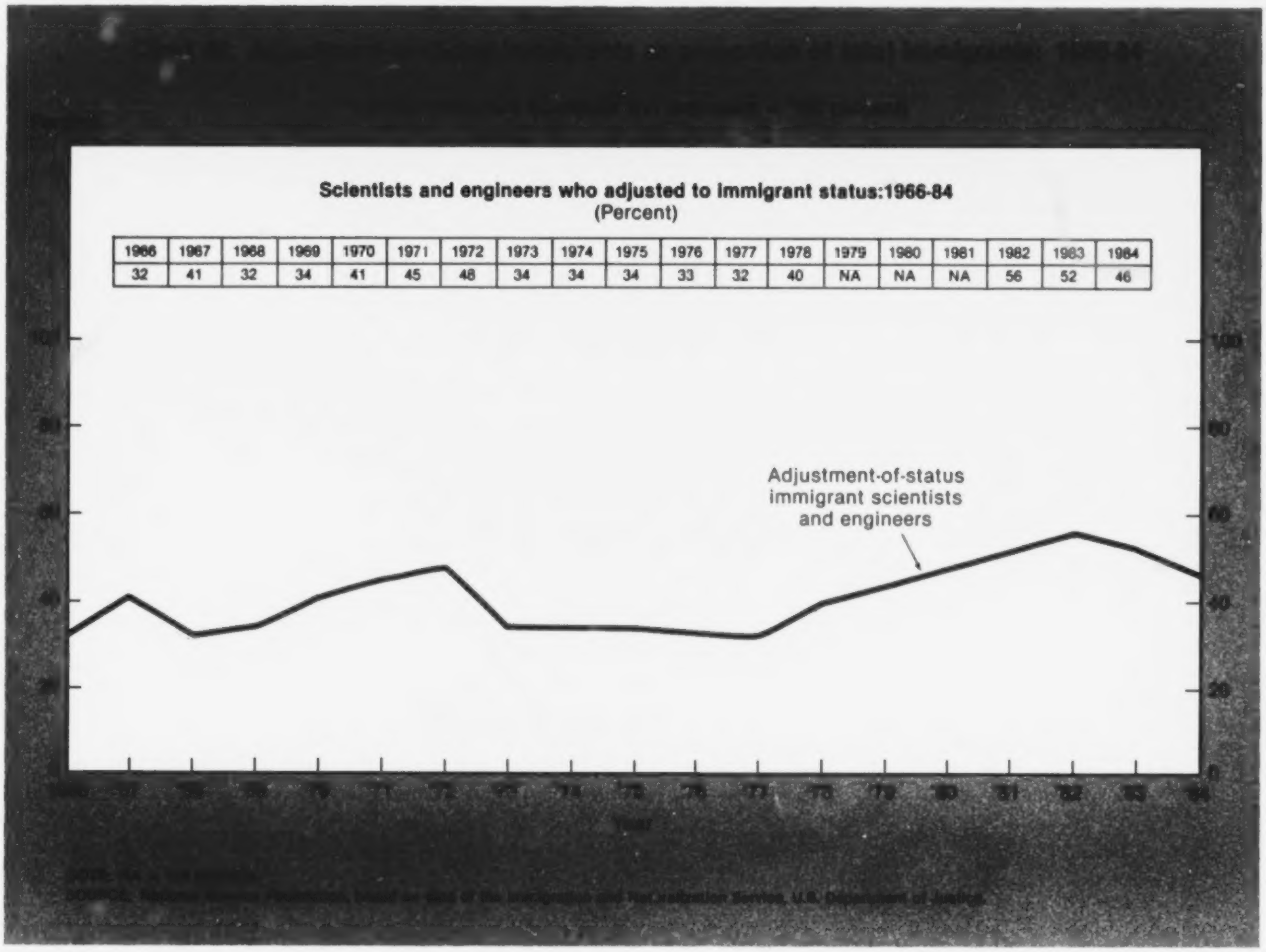


Immigrant scientists and engineers: 1966-84
(in thousands)

	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Total	7.2	12.5	13.0	10.3	13.3	13.1	11.3	6.6	6.3	7.4	7.9	8.4	10.9	NA	NA	NA	12.2	10.6	9.5
Certified	NA	9.0	9.1	7.2	10.3	10.0	8.3	3.4	2.6	3.4	3.0	2.8	3.1	NA	NA	NA	5.0	4.4	3.5
Noncertified......	NA	3.5	3.9	3.0	3.0	3.1	3.0	3.2	3.7	4.0	5.0	5.6	7.8	NA	NA	NA	7.2	6.2	6.0

NOTE: NA = not available.
SOURCE: National Science Foundation, based on data of the Immigration and Naturalization Service, U.S. Department of Justice.

The proportion of foreign scientists and engineers whose status changed from nonimmigrant to immigrant (adjustment-of-status) increased between 1968 and 1972 because of changes in the law permitting the backlog of Asians who already had entered the United States on temporary visas and were awaiting quota preferences to be admitted as immigrants (chart 40). The level of adjustment increased since 1976 for three reasons: First, direct immigration of workers who had not obtained a job commitment in the United States was restricted. Second, there was an increase in the pool of foreign S/E students, many of whom sought to remain in the United States after graduation. Third, foreign citizens from non-contiguous Western Hemisphere countries on temporary visas were allowed for the first time to adjust their status.



Scientists and engineers who adjusted to immigrant status:1966-84
(Percent)

1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
32	41	32	34	41	45	48	34	34	34	33	32	40	NA	NA	NA	56	52	46

NOTE: NA = not available.
SOURCE: National Science Foundation, based on data of the Immigration and Naturalization Service, U.S. Department of Justice.

section 6.

alternative futures

This section considers alternative futures for the participation of foreign citizens in U.S. science and engineering. Employment opportunities for foreign citizens in the United States are strongly affected by the domestic supply of S/E personnel. Demographic projections suggest a decline in the flow of new native-born U.S. citizens into the S/E labor force. Should that occur, the effects would be felt in higher education as well as in employing organizations, since many foreign citizens who enter the U.S. S/E labor force come first as students. The analysis in this section examines the projected S/E labor force requirements in 1995 and presents several scenarios for new supply from U.S. and foreign citizens.

In the past decade there have been increases in proportions of the S/E labor force that are foreign-born and in foreign student participation, particularly in S/E disciplines at the graduate level. The declining numbers of U.S. citizens choosing some S/E disciplines, and the simultaneous increases in numbers of foreign citizens, have focused attention on enrollments and degrees from U.S. higher education institutions separate from the long-term issue of the adequacy and composition of the U.S. labor force. Current institutional concerns include the attraction of capable U.S. students for graduate study and the availability of adequate numbers of doctorates to fill faculty positions, particularly in engineering.

total s/e employment in 1995

Although the characteristics of the S/E labor force in 1995 cannot be described with certainty, current trends suggest continued growth. The Bureau of Labor Statistics (BLS), using a macroeconomic model, has projected the size and race, gender and occupational mix of the total and S/E labor forces for the period 1982 to 1995.[17] Using both economic and demographic assumptions, BLS projected total employment in S/E fields to increase as much as 40 percent between 1984 and 1995 (table 12). This projected employment growth for S/E fields is greater than for the total.

BLS tested the sensitivity of the overall labor force projections to economic and demographic assumptions. The sets of economic assumptions did not substantially alter the results, whereas the demographic assumptions had a considerable impact. The total labor force difference between the high and low economic growth scenarios is less than 3 million in 1995. In contrast, the difference between the high and low demographic scenarios is about 16 million at the end of the period. In other words, changes in assumptions about labor force participation rates for different age, gender, and race groups have a greater effect on the projections than do changes in assumptions about real earnings and unemployment rates.

Based on the BLS macroeconomic model incorporating both demographic and economic assumptions, the following changes in labor force trends are expected:

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[17] BLS cautions that, although the projections reflect detailed analyses of factors expected to affect occupational trends, the development of projections is not a precise statistical process and the future cannot be precisely predicted.

Table 12. Civilian employment in selected science, engineering, and technician occupations: actual 1979 and 1984, and projected 1995

	Total employment (in thousands)				Percent change		Average annual growth (percent)	
			1995		1984-95		1984-95	
Occupation	1979	1984	Low trend	High trend	Low trend	High trend	Low trend	High trend
Total, all occupations	101,206	106,843	117,268	127,760	9.8	19.6	0.8	1.6
Total, science/engineering	2,094	2,175	2,843	3,038	30.7	39.7	2.5	3.1
Engineers	1,177	1,331	1,734	1,877	30.3	41.0	2.4	3.2
Electrical	300	390	571	617	46.4	58.2	3.5	4.3
Civil	156	175	214	229	22.3	30.9	1.8	2.5
Other	721	766	949	1,031	23.9	34.6	2.0	2.7
Scientists	917	844	1,109	1,161	31.4	37.6	2.5	2.9
Life and physical	247	299	328	338	9.7	13.0	.8	1.1
Mathematical	48	51	61	65	19.6	27.5	1.6	2.2
Computer	447	308	498	539	61.7	75.0	4.5	5.2
Social	175	186	212	219	14.0	17.7	1.2	1.5
Science/engineering technicians	1,227	1,314	1,615	1,747	22.9	33.0	1.9	2.6

NOTE: These projections are based on alternative assumptions regarding economic factors applied to a middle-growth demographic scenario.

SOURCE: Bureau of Labor Statistics, *Monthly Labor Review*, November 1983, p.38, and November 1985, p. 46

(1) the total labor force will grow more slowly than in the previous decade;

(2) women and minorities will account for a greater proportion of the overall labor force;

(3) young members of the labor force (16 to 24 years of age) will decline in absolute numbers;

(4) the number of prime-age members of the labor force (25-54 years of age) will grow faster than the total labor force.

In general, the projected changes in the demographic characteristics of the labor force suggest increased employment of skilled personnel as the labor force ages and the number of young workers declines. BLS projects a significant increase in employment in jobs requiring a college education or specialized postsecondary technical training in 1995. Much of the growth is expected in S/E fields despite some technological displacement at the technician level (e.g., CAD-CAM capabilities will limit the employment growth of drafters).

Scientists and engineers will constitute 5 percent of the growth in total employment between 1984 and 1995. BLS forecasts between 668,000 and 863,000 *new* jobs in S/E fields as well as between 301,000 and 433,000 new jobs for S/E technicians over the period. Technology-oriented employment will increase by 28 percent to 37 percent, whereas total employment will expand by only 10 percent to 20 percent. By 1995, S/E occupations will account for about 2.5 percent of total employment compared to 2 percent in 1984.[18]

Economic conditions will only marginally affect the overall employment of scientists and engineers. Technology-oriented jobs are concentrated in manufacturing industries which exhibit relatively stable employment growth under the alternative BLS economic growth scenarios. In part, S/E employment is sustained under the low growth scenario by the assumption of greater defense spending. Less than 20 percent of the variation in non-agricultural employment in 1995 under the different economic assumptions is attributable to differences in manufacturing employment. The service industries have been much more sensitive to changes in economic assumptions than manufacturing industries, although recently they have exhibited continuing growth even in periods of recession. Service industries are employing growing numbers of S/E personnel, most notably those related to computer and data processing services.

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[18] The BLS categorization of occupations as scientific and technical excludes some positions (most importantly, managers of S/E activities and college faculty in S/E fields) counted as S/E fields by NSF. Thus, BLS reports a smaller proportion of the labor force as being in S/E occupations than does NSF. The significance of the BLS projections is the expected growth in this share of the labor force.

According to the BLS projections, about 27 percent of the new S/E jobs created between 1984 and 1995 will be in computer specialties, regardless of economic conditions. About 61 percent of the new jobs will be in engineering under both low and high growth scenarios which only marginally affect the field distribution of engineering growth. Over 40 percent of this increase of from 403,000 to 546,000 new engineering jobs will be in electrical engineering regardless of the economic assumptions.

Using the rate of increase from the low growth scenario, there will be approximately 68,000 new S/E jobs added in the year 1995. Assuming a 3 percent demand to replace persons leaving S/E jobs through normal turnover, about 136,000 additional S/E personnel will be required in that year.

The relationship between new S/E job entrants and degree recipients involves many factors, as figures for 1984 illustrate. The estimated number of S/E job openings in 1984, allowing for both replacement and job growth, was 109,000. The estimated number of S/E baccalaureate recipients for that year was 300,000, and the number of doctorate recipients in science and engineering was almost 13,000. The aggregate ratio of degree recipients to jobs was therefore about 3 to 1.

Despite this ratio, the unemployment rate of new S/E graduates remains low, around 3 percent, a rate considerably lower than that for the labor force as a whole.[19] Labor market balance in the S/E fields is achieved through such mechanisms as continued full-time study, employment in non-S/E jobs, and field mobility.

Only a fraction of new S/E baccalaureates are used to fill additional and replacement job openings in a given year. Substantial proportions of S/E undergraduates continue their studies, the proportion being dependent upon field of study, current and anticipated job availability, and degree requirements. In 1984, between 5 percent and 16 percent of the baccalaureate recipients in mathematics, computer science and engineering pursued full-time graduate studies; between 20 percent and 35 percent of the baccalaureates in the other science fields continued their studies.

Many other S/E new entrants find employment in fields outside science and engineering. Again, the share depends upon job availability and field requirements. In 1984, less than 30 percent of the social science baccalaureates were working in S/E jobs, whereas between 75 percent and 90 percent of those holding degrees in mathematics, computer science, and engineering were employed in S/E jobs.

This behavior among new S/E graduates suggests that there is flexibility in the new entrant component of the S/E labor market. Given the possible decline in new supply which could result from demographic trends, future growth in S/E job openings could be met by increasing the share of degree recipients who are drawn into S/E jobs. Generalizing in the aggregate, of course, ignores potential shortages in specific fields. For example, new and replacement demand for electrical engineers could exceed the number of new entrants available for employment.

s/e degree awards

This section examines scenarios for future higher education S/E degree production. Projected trends for the U.S. population provide the context for the discussion. Earlier sections describing foreign students in U.S. science and engineering highlighted areas of differences in participation that are considered in this examination of alternative futures. The participation of foreign students varies between undergraduate and graduate levels; hence, baccalaureates and doctorates are considered separately. Similarly, foreign participation in science differs from that in engineering, so these broad areas are treated independently.

The demographic trends for the traditional age groups in the U.S. population that have provided the bachelor's and doctor's pools are fundamental to the consideration of alternative futures, at least at the bachelor's level. The decline in U.S. births that began in the late fifties is now affecting higher education. The number of 22-year-olds, the traditional age for bachelor's-degree recipients, peaked in 1983 at 4.5 million (chart 41). By the year 1995, it will be 26 percent lower than it was in 1983. The decline will not be uniform, however. A period of sharp decline will continue until 1990. Similar demographic changes will not begin to affect the number of 30-year-olds, the reference group for doctorate degrees, until after 1991.

The basic analytic measure used to develop scenarios in this section is the number of S/E degrees per thousand in the U.S. population, referred to as the participation rate for a subject group. The reference point for S/E baccalaureates is 1984, the most recent year for which such data are available. For doctorates, data for

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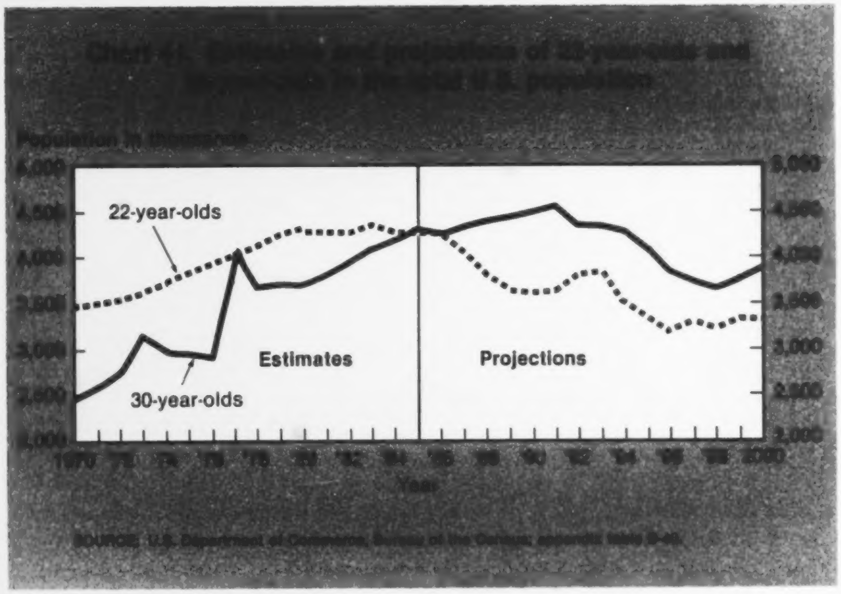
[19] National Science Foundation, "Science and Engineering Graduates Find Increasing Opportunities for Employment in S/E Occupations," *Science Resources Studies Highlights* (NSF 85-334) (Washington, D.C., February 14, 1986).

Chart [illegible]. Estimates and projections of 22-year-olds and 30-year-olds in the total U.S. population



SOURCE: U.S. Department of Commerce, Bureau of the Census; appendix table [illegible].

1985 are used. The use of these reference years does not imply that the numbers of S/E degrees awarded in those years was ideal or that they would be appropriate in some future year.

science baccalaureates

In 1984, the 238,135 science bachelor's degrees awarded represented approximately 56 degrees per thousand 22-year-olds in the U.S. population (table 13). To produce an equal

Table 13. Science baccalaureates awarded per thousand U.S. population by sex: actual 1970-84 and extrapolated to 1995

Year	Science baccalaureates						22-year-old U.S. population (thousands)		
	Total		Men		Women				
	(Number)	(per 000)	(Number)	(per 000)	(Number)	(per 000)	Total	Men	Women
Actual									
1970	219,350	62.78	150,810	85.83	68,540	39.46	3,494	1,757	1,737
1971	225,789	64.35	153,158	87.07	72,631	41.50	3,509	1,759	1,750
1972	235,225	67.00	158,055	89.70	77,170	44.12	3,511	1,762	1,749
1973	248,402	67.94	165,143	89.80	83,259	45.82	3,656	1,839	1,817
1974	261,532	69.61	170,445	90.09	91,087	48.84	3,757	1,892	1,865
1975	254,855	65.97	162,373	83.53	92,482	48.19	3,863	1,944	1,919
1976	253,060	63.73	158,906	79.61	94,154	47.67	3,971	1,996	1,975
1977	246,962	60.89	151,595	74.27	95,367	47.33	4,056	2,041	2,015
1978	240,756	58.45	144,193	69.59	96,563	47.17	4,119	2,072	2,047
1979	234,905	54.82	137,532	63.73	97,373	45.78	4,285	2,158	2,127
1980	232,743	53.94	132,783	59.47	99,960	46.75	4,315	2,177	2,138
1981	230,799	53.52	129,474	59.58	101,325	47.37	4,312	2,173	2,139
1982	234,327	54.49	129,503	59.71	104,824	49.19	4,300	2,169	2,131
1983	234,271	53.62	128,379	58.25	105,892	48.91	4,369	2,204	2,165
1984	238,135	55.61	130,952	60.63	107,183	50.51	4,282	2,160	2,122
Extrapolated trends (assume a stationary rate for men, continuation of past increases for women)							Projected		
1985	236,500	56.15	128,900	60.63	107,600	51.56	4,212	2,126	2,086
1986	237,800	56.46	129,000	60.63	108,800	52.61	4,212	2,144	2,068
1987	231,100	57.22	124,400	60.63	106,700	53.66	4,039	2,051	1,988
1988	219,300	57.71	117,100	60.63	102,200	54.71	3,800	1,932	1,868
1989	214,500	58.22	113,300	60.63	101,200	55.76	3,684	1,869	1,815
1990	213,400	59.26	111,000	60.63	102,400	57.81	3,601	1,830	1,771
1991	220,700	59.76	113,800	60.63	106,900	58.86	3,693	1,877	1,816
1992	229,000	60.29	117,300	60.63	111,700	59.91	3,798	1,934	1,864
1993	231,200	60.79	117,400	60.63	113,800	60.96	3,803	1,936	1,867
1994	212,100	61.32	106,700	60.63	105,400	62.03	3,459	1,760	1,699
1995	205,100	61.32	103,100	60.63	102,000	62.03	3,345	1,701	1,644

NOTE: The extrapolated trends apply assumptions about degree production to Census population projections.

SOURCES: Department of Education, Center for Education Statistics; Bureau of the Census: and National Science Foundation number of science baccalaureates in the year 1995, degree production would have to reach approximately 71 per thousand 22-year-olds. In the past, men and women have differed with respect to the number of degrees per thousand 22-year-olds; in 1984, the rate was 61 for men and 51 for women. For men, the peak rate occurred in 1974 at 90 per thousand. The 1984 rate for women represented a high for that group.

The above scenario reflects one simplifying assumption which has the effect of slightly raising the computed participation rates of U.S. citizens for the seventies. It was not possible to subtract the number of degree awards to foreign citizens from the time series. Hence, all science degrees awarded were assumed to have been earned by U.S. citizens. Since, according to the most recent data available, about 7,000 science baccalaureates are awarded to foreign citizens annually, the actual number of degrees per thousand for U.S. men and women is about 1 degree less per thousand for men and for women than the figures used in the scenarios.

Women's participation. Over the past decade the participation of women in science has been increasing while that of men has decreased. If it is assumed that there will be no further decline in the participation rate for men and that the increase for women over the 1985-95 period will equal that for 1970-84, the projected number of science bachelor's degrees in 1995 would be 205,100, 14 percent less than in 1984 (table 13). Higher participation rates for either women or men would yield more degrees for the same population base. If, for example, the goal were to be a rate for both sexes combined of 71 per thousand in 1995, the necessary increase over the 1984 rates would be 11 per thousand (18 percent) for men and 20 per thousand (39 percent) for women (table 14). Whether such a large increase in the rate for women could actually be achieved is questionable. In fact, it should be noted that recent increases in the rate for women have been less than they were in the early seventies.

Table 14. Science baccalaureates per thousand U.S. 22-year-olds in year 1995 required to equal 1984 degree production

Men and women combined	Men	Women
71	95	47
71	92	50
71	91	51[1]
71	90	52
71	80	62
71	70	72
71	60[1]	82
71	56[1]	87
71	50	93

[1] 1984 rate.

SOURCE: National Science Foundation

Minority participation. Minorities have generally had S/E participation rates lower than those for whites; Asians have been the exception. Because of the relative size of the minority population,[20] however, even a dramatic increase in minority participation will do little to increase the absolute numbers of science baccalaureates. In 1983, the most recent year for which data on baccalaureate degrees earned by minorities are available, the minority population earned 41 science baccalaureates per thousand, compared to 56 per thousand for whites.

From the present until 1995, the number of minority 22-year-olds will fall, but not as much as the number for whites. Thus, minorities will rise as a proportion of all 22-year-olds from 16 percent to 19 percent. Raising minority participation to the most recent level for whites would add 9,600 science degrees to the 186,000 that would be awarded in 1995 if rates overall stayed at the present level. This would increase the total by only 5 percent.

engineering baccalaureates

In contrast to science, the number of engineering baccalaureates per thousand 22-year-olds was higher in 1984 for both men and women than it had been at any other time during the 1970-84 period. While the rate for women is increasing, it remains very low compared to the rate for men (5 per thousand compared to 30 per thousand, table 15) and is much lower than the rate for women in the sciences, 51 per thousand. The high rate for both sexes combined for 1984, nearly 18 degrees per thousand, makes further increases of any magnitude above the observed participation rates more tentative than they were in the case of science. Yet the goal of maintaining the 1984 number of baccalaureate degrees in engineering in the year 1995 would require an increase in participation rates for men and women combined, from 18 per thousand in 1984 to 23 per thousand in 1995.

Women's participation. In 1984 women earned 5 engineering baccalaureates per one thousand 22-year-olds, a dramatic increase over their 1970 rate of 1 per 5,000, but much less than the rate for men, 30 per thousand in 1984. If it is assumed that by 1995 the rate for women doubles to reach 10 and the rate for men is unchanged at the 1984 level of 30, total projected engineering baccalaureates would be 68,100, still 11 percent less than in 1984. To reach the 1984 level for engineering bachelor's degrees with the 1995 population base would require substantial increases in the rates for both men and women.

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[20] Data on minorities were obtained from the Bureau of the Census. Because Hispanics are defined as an ethnic group independent of race, Hispanics are not included in these calculations on the minority population. Degree awards to Hispanics are included in the counts of awards to minorities, however. In 1984, Hispanics earned 9,700 baccalaureates in science and engineering fields, comprising about 4 percent of S/E baccalaureates.

Table 15. Engineering baccalaureates awarded per thousand U.S. population by sex: actual 1970-84 and extrapolated to 1995

Year	Engineering baccalaureates						22-year-old U.S. population (thousands)		
	Total		Men		Women				
	(Number)	(per 000)	(Number)	(per 000)	(Number)	(per 000)	Total	Men	Women
				Actual					
1970	44,772	12.81	44,434	25.29	338	0.19	3,494	1,757	1,737
1971	45,387	12.93	45,022	25.60	365	.21	3,509	1,759	1,750
1972	46,003	13.10	45,502	25.82	501	.29	3,511	1,762	1,749
1973	46,989	12.85	46,409	25.24	580	.32	3,656	1,839	1,817
1974	43,530	11.59	42,824	22.63	706	.38	3,757	1,892	1,865
1975	40,065	10.37	39,205	20.17	860	.45	3,863	1,944	1,919
1976	39,114	9.85	37,671	18.87	1,443	.73	3,971	1,996	1,975
1977	41,581	10.25	39,495	19.35	2,086	1.04	4,056	2,041	2,015
1978	47,411	11.51	43,914	21.19	3,497	1.71	4,119	2,072	2,047
1979	53,720	12.54	48,801	22.61	4,919	2.31	4,285	2,158	2,127
1980	59,240	13.73	53,226	24.45	6,014	2.81	4,315	2,177	2,138
1981	64,068	14.86	56,951	26.21	7,117	3.33	4,312	2,173	2,139
1982	67,791	15.77	59,454	27.41	8,337	3.91	4,300	2,169	2,131
1983	72,954	16.70	63,235	28.69	9,719	4.49	4,369	2,204	2,165
1984	76,531	17.87	65,698	30.42	10,833	5.11	4,282	2,160	2,122
			Extrapolated trends (assume a stationary rate for men, doubling of rate for women)					Projected	
1985	75,700	17.97	64,700	30.42	11,000	5.25	4,212	2,126	2,086
1986	76,700	18.21	65,200	30.42	11,500	5.56	4,212	2,144	2,068
1987	74,300	18.40	62,400	30.42	11,900	6.00	4,039	2,051	1,988
1988	70,900	18.66	58,800	30.42	12,100	6.50	3,800	1,932	1,868
1989	69,600	18.89	56,900	30.42	12,700	7.00	3,684	1,869	1,815
1990	69,000	19.16	55,700	30.42	13,300	7.50	3,601	1,830	1,771
1991	71,600	19.39	57,100	30.42	14,500	8.00	3,693	1,877	1,816
1992	74,600	19.64	58,800	30.42	15,800	8.50	3,798	1,934	1,864
1993	75,700	19.91	58,900	30.42	16,800	9.00	3,803	1,936	1,867
1994	69,600	20.12	53,500	30.42	16,100	9.50	3,459	1,760	1,699
1995	68,100	20.36	51,700	30.42	16,400	10.00	3,345	1,701	1,644

NOTE: The extrapolated trends apply assumptions about degree production to Census population projections.

SOURCES: Department of Education, Center for Education Statistics; Bureau of the Census; and National Science Foundation

Minority participation. In 1983, minorities earned 10 engineering baccalaureates per thousand 22-year-olds, compared to the average of 15 for whites. Raising minority participation to the present level for whites by 1995 would add 3,200 degrees to the total that minorities would be expected to earn at their present rates. If participation of others stayed at present levels, total engineering baccalaureates would increase by 5 percent, to 63,000, in 1995.

baccalaureate degrees to foreign citizens

Changes in the number of foreign students studying science and engineering in the United States can be viewed as either independent of, or dependent upon, domestic demographic trends. It may be assumed that the number of foreign students wishing to study in this country will continue to increase, although economic conditions, technological advances, and population growth could each alter demand. The enrollment of foreign students, however, may reflect the ability of individual institutions to attract capable U.S. students. In this instance, the acceptance of foreign students by U.S. institutions may be related to U.S. demography.

Two alternatives incorporating these different views of foreign participation were formulated:

(1) *A continuation of current rates of increase in degrees for foreign citizens parallel to their current rates of increase in enrollment.* This alternative assumes a high annual increase in the early eighties, reflecting the enrollment surge from the late seventies, slowing to an increase of 3 percent per year, which is the long-term average growth rate since the early fifties.

(2) *An increase in participation rates of foreign citizens sufficient to maintain S/E baccalaureates at the last actual level.* If U.S. citizen participation rates were to hold at their current levels, increases of between 5 percent and 10 percent in the numbers of foreign students receiving degrees would be necessary for some years. These increases are lower than some observed in the late seventies.

The first alternative, a steady increase in foreign enrollment, and hence in degrees, of about 3 percent per year, would raise the number of science baccalaureates earned by foreign citizens to nearly 10,000 in 1995. For engineering, a continuing increase would raise the number of baccalaureates to foreigners to 9,000 in 1995. Assuming the levels of U.S. participation were to follow the extrapolated trends shown earlier in this section, the degrees to foreign citizens would become a larger proportion of the total, 5 percent in science and 13 percent in engineering. The combined effect of these steady increases would not restore the total number of science or engineering degrees in 1995 to their 1983 levels, however; to sustain the 1983 levels in 1995, participation rates for U.S. citizens would have to increase further.

The second alternative, foreign participation to compensate for U.S. demographic trends assuming no change in U.S. participation rates, would require much faster growth in foreign enrollment than is now occurring. This rapid growth would yield 60,000 science and 18,700 engineering baccalaureates earned by foreign citizens in the year 1995. Numbers of foreign citizens receiving science baccalaureates would be nine times as large as in 1983; engineering baccalaureates, three times as great. If these increases occurred, foreign citizens would constitute 25 percent of all science baccalaureates and 23 percent of all engineering baccalaureates.

science doctorates

In 1985, U.S. citizens earned 11,342 science doctorates (table 16). To produce the same number of U.S. citizens earning science doctorates in the year 1995 as in 1985, there would have to be over 2.7 degrees per thousand 30-year-olds, somewhat higher than the 1985 level. The 1985 totals incorporate the effects of sharply different trends for men and women in the number of science doctorates per thousand 30-year-olds. Men declined from 8.5 per thousand in 1970 to 3.5 per thousand in 1985. Women increased slightly during this time, from 1.1 per thousand in 1970 to 1.7 in 1985. A level of 2.8 degrees per thousand 30-year-olds could be reached by many combinations of rates for men and women, some of which are shown in table 17.

It was noted earlier that a much different demographic picture applies to the population group serving as the reference for doctorates than the group for baccalaureates. During the period 1970-85, the number of 30-year-olds in the population increased by about 74 percent. The U.S. population of 30-year-olds is continuing to increase, and will peak in 1991 at nearly 4.6 million, 6 percent more than in 1985. The 1995 level is within 5 percent of the 4.3 million of 1985. This projected number of 30-year-olds in 1995 is considerably greater than the number in 1971, when the number of U.S. science doctorate awards was highest.

In contrast to the increasing population, the number of science doctorates awarded to U.S. citizens in 1985 was 11 percent less than in the 1971 peak year. Men accounted for all the decrease, dropping by 31 percent from their peak of 11,090 in 1971 to 7,669 in 1985. Degrees awarded to women grew every year until 1984, increasing by 180 percent to 3,754, then falling back 2 percent to 3,673 in 1985.

The trends of the recent past suggest that population, by itself, is unlikely to have much effect on the number of doctorates awarded through the year 1995. The discussion of alternative futures for doctorates will use population only as a broad context for considering trends in degree awards. The drop in science doctorates has occurred during a period of increasing numbers of 30-year-olds. Thus the decline is much more severe when expressed in terms of the number of degrees per thousand 30-year-olds than when it is presented in absolute terms. Separate presentations of trends for men and women underscore the major differences in award rates by gender.

If it is assumed that the participation rate for men does not decline further and that the rate for women resumes a pattern of increase and grows as much over the 1986-95 period as it did in 1970-85, science doctorate production would be greater in each extrapolated year than in 1985. The figure for U.S. citizens in 1995 would be 8.5 percent greater than in 1985.

Minority and foreign citizen participation. The topics of minority participation and foreign citizen participation in S/E doctorates are interrelated in several ways. Members of racial minorities who are foreign citizens in this country on permanent (immigrant) visas traditionally have been included with U.S. citizens for purposes of calculating U.S. minority participation. These persons are a sizeable group numerically and make a major difference in computed participation rates. In 1985, native-born U.S. minority students

Table 16. Science doctorates awarded per thousand U.S. population by sex: actual 1970-85 and extrapolated to 1995

Year	Science doctorates to U.S. citizens						30-year-old U.S. population (thousands)		
	Total		Men		Women				
	(Number)	(per 000)	(Number)	(per 000)	(Number)	(per 000)	Total	Men	Women
	Actual								
1970	11,812	4.75	10,469	8.50	1,343	1.07	2,488	1,232	1,256
1971	12,706	4.83	11,090	8.49	1,616	1.22	2,632	1,306	1,326
1972	12,577	4.50	10,858	7.82	1,719	1.22	2,795	1,388	1,407
1973	12,541	3.95	10,514	6.66	2,027	1.27	3,178	1,579	1,599
1974	11,706	3.89	9,626	6.45	2,080	1.37	3,008	1,492	1,516
1975	12,299	4.15	9,920	6.73	2,379	1.59	2,966	1,473	1,493
1976	12,216	4.19	9,715	6.69	2,501	1.71	2,913	1,452	1,461
1977	11,935	2.98	9,349	4.68	2,586	1.29	4,000	1,999	2,001
1978	11,842	3.18	9,063	4.89	2,779	1.49	3,721	1,855	1,866
1979	11,964	3.20	8,959	4.82	3,005	1.60	3,734	1,857	1,877
1980	11,924	3.19	8,717	4.69	3,207	1.71	3,737	1,860	1,877
1981	12,128	3.12	8,767	4.53	3,361	1.72	3,886	1,935	1,951
1982	11,853	2.97	8,394	4.21	3,459	1.73	3,990	1,993	1,997
1983	11,922	2.90	8,183	3.99	3,739	1.82	4,107	2,053	2,054
1984	11,716	2.77	7,952	3.76	3,764	1.78	4,225	2,114	2,111
1985	11,342	2.62	7,669	3.54	3,673	1.71	4,322	2,169	2,154
	Extrapolated trends (assume a stationary rate for men, increasing rate for women)						Projected		
1986	11,360	2.68	7,500	3.54	3,860	1.82	4,242	2,119	2,123
1987	11,870	2.72	7,740	3.54	4,130	1.89	4,369	2,185	2,184
1988	12,090	2.75	7,800	3.54	4,290	1.96	4,394	2,204	2,190
1989	12,390	2.79	7,890	3.54	4,500	2.03	4,445	2,230	2,215
1990	12,740	2.82	8,020	3.54	4,720	2.10	4,513	2,266	2,247
1991	13,050	2.86	8,120	3.54	4,930	2.17	4,569	2,294	2,275
1992	12,610	2.89	7,770	3.54	4,840	2.24	4,356	2,194	2,162
1993	12,710	2.93	7,760	3.54	4,950	2.31	4,332	2,192	2,140
1994	12,700	2.97	7,660	3.54	5,040	2.38	4,283	2,164	2,119
1995	12,300	2.99	7,340	3.54	4,960	2.43	4,113	2,073	2,040

NOTE: The extrapolated trends apply assumptions about degree production to Census population projections.

SOURCES: National Research Council, Bureau of the Census, and National Science Foundation

Table 17. Science doctorates per thousand U.S. 30-year-olds in 1995 required to equal 1985 degree production

Men and women combined	Men	Women
2.8	5.0	0.5
2.8	4.5	1.0
2.8	4.0	1.5
2.8	3.7	1.8[1]
2.8	3.5[1]	2.0
2.8	3.0	2.5

[1] 1985 rate.

SOURCE: National Science Foundation

earned 1.3 science doctorates per thousand, fewer than for U.S. women and less than the 3.1 per thousand for whites. Including minorities who are non-U.S. citizens on permanent visas in the minority figures nearly doubles the science doctorate participation rate, raising it to 2.4 per thousand, only slightly less than the 2.6 per thousand for U.S. citizens.

In the year 1995, the number of minority 30-year-olds will be higher in absolute numbers than it was in 1985, while the number of whites will be slightly less. Hence, the proportion of minorities among 30-year-olds will increase from about 15 percent to 18 percent. Raising the participation of native-born U.S. minority students to the 1985 level for the population overall by 1995, which would require a substantial increase, would add 1,000 science doctorates, a 9-percent increase for the total expected if 1985 overall participation rates continued unchanged through 1995, or an 8-percent increase under the scenario of increasing rates that was presented in table 16.

Foreign graduate students continue to increase in numbers, but more slowly than in the late seventies. The current growth in enrollment of foreign graduate students in the sciences (1.8 percent between 1983 and 1984) is below the overall average rate of 7.3 percent from 1977 to 1984. If the increase in awards to foreign citizens were to continue at the relatively high rate of 7 percent a year, they would account for 6,100 science doctorates in 1995. Their share of the projected doctorates in that year could be above 30 percent, compared to their 22 percent share in 1985. The more moderate rate of increase observed recently, however, 2 percent a year, would sustain their present proportion of all science doctorates under the scenario considered here.

engineering doctorates

The number of engineering doctorates awarded to U.S. citizens was nearly 50 percent lower in 1985 than in 1970, despite slight increases in the number earned during the last two years. The number of 30-year-olds in the population increased by about 74 percent during this time (table 18). Degrees awarded to men

Table 18. Engineering doctorates awarded per thousand U.S. population by sex: actual 1970-85 and extrapolated to 1995

Year	Engineering doctorates to U.S. citizens						30-year-old U.S. population (thousands)		
	Total		Men		Women				
	(Number)	(per 000)	(Number)	(per 000)	(Number)	(per 000)	Total	Men	Women
	Actual								
1970	2,514	1.01	2,503	2.03	11	0.01	2,488	1,232	1,256
1971	2,418	.92	2,415	1.85	3	.00	2,632	1,306	1,326
1972	2,330	.83	2,314	1.67	16	.01	2,795	1,388	1,407
1973	2,142	.67	2,121	1.34	21	.01	3,178	1,579	1,599
1974	1,752	.58	1,734	1.16	18	.01	3,008	1,492	1,516
1975	1,716	.58	1,684	1.14	32	.02	2,966	1,473	1,493
1976	1,557	.53	1,523	1.05	34	.02	2,913	1,452	1,461
1977	1,472	.37	1,430	.72	42	.02	4,000	1,999	2,001
1978	1,244	.33	1,231	.66	13	.01	3,721	1,855	1,866
1979	1,293	.35	1,254	.68	39	.02	3,734	1,857	1,877
1980	1,255	.34	1,191	.64	.64	.03	3,737	1,860	1,877
1981	1,170	.30	1,117	.58	53	.03	3,886	1,935	1,951
1982	1,169	.29	1,095	.55	74	.04	3,990	1,993	1,997
1983	1,173	.29	1,090	.53	83	.04	4,107	2,053	2,054
1984	1,240	.29	1,151	.54	89	.04	4,225	2,114	2,111
1985	1,279	.30	1,160	.53	119	.06	4,322	2,169	2,154
	Extrapolated trends (assume a stationary rate for men, doubling of rate for women)						Projected		
1986	1,250	0.29	1,120	0.53	130	0.06	4,242	2,119	2,123
1987	1,290	.30	1,160	.53	130	.06	4,369	2,185	2,184
1988	1,300	.30	1,170	.53	130	.06	4,394	2,204	2,190
1989	1,340	.30	1,180	.53	160	.07	4,445	2,230	2,215
1990	1,360	.30	1,200	.53	160	.07	4,513	2,266	2,247
1991	1,400	.31	1,220	.53	180	.08	4,569	2,294	2,275
1992	1,350	.31	1,160	.53	190	.09	4,356	2,194	2,162
1993	1,370	.32	1,160	.53	210	.10	4,332	2,192	2,140
1994	1,380	.32	1,150	.53	230	.11	4,283	2,164	2,119
1995	1,340	.33	1,100	.53	240	.12	4,113	2,073	2,040

NOTE: The extrapolated trends apply assumptions about degree production to Census population projections.

SOURCES: National Academy of Sciences, Bureau of the Census, and National Science Foundation accounted for all the decline, dropping from 2,503 in 1970 to 1,160 in 1985.

As in science fields, the long-term general pattern of engineering doctorates in comparison to the population of U.S. 30-year-olds has been one of declines for men and increases for women. Doctorates to U.S. men in engineering, however, have increased for two successive years (compared to continuing decreases for U.S. men in sciences), and doctorates to U.S. women in engineering have continued to increase (compared to the small decline in sciences). Women earned a total of 119 engineering doctorates in 1985, up from 11 in 1970.

Because of the smaller numbers of doctorates in engineering, the discussion of "rates" here will express degrees in relation to one *hundred* thousand persons in the population rather than to one thousand persons. Although the rate for women has increased to 6 degrees per one hundred thousand U.S. 30-year-old women, it remains much lower than the rate for men (53 per one hundred thousand). Rates for both sexes in engineering are much lower than the rates for women and men in the sciences, which are 1.7 and 3.5 per thousand, respectively (equivalently, 170 and 350 per one hundred thousand).

If it is assumed that the current participation rate for men remains steady and that the rate for women doubles the 1985 rate, increasing to 12 per one hundred thousand 30-year-olds, engineering doctorate production for U.S. citizens would exceed the 1985 level throughout the next decade. Even so, the projected 1995 number would be 46 percent less than the level was in 1970.

Minority and foreign citizen participation. The participation rates for minorities in engineering doctorates are higher than those of U.S. citizens overall, if foreign citizens in this country on permanent visas are included with U.S. citizens. In 1985, U.S. and non-U.S. citizens who were minorities earned 5 engineering doctorates per one hundred thousand 30-year-olds compared to the average of 30 per hundred thousand for the total U.S. population. If non-U.S. citizens are excluded from the numbers of minorities earning doctorates, the participation drops below 2 engineering doctorates per one hundred thousand minority 30-year-olds. The high number of Asian-Americans on permanent visas who received engineering doctorates in 1985 (over 280) raised the participation rates for engineering doctorates above those that would have been expected if rates for minorities equalled rates for other population groups.

If foreign citizens' participation in engineering doctorates were to increase at the average annual rate of 2 percent, foreign citizens would earn 2,100 doctorates in 1995. They would outnumber U.S. citizen doctorates by a ratio of 3 to 2, more than they do at present. A lesser annual increase of 1 percent would result in 1,900 engineering doctorates to foreigners in 1995 and would maintain their current majority (57 percent of all doctorates) assuming a continuation of the increases considered earlier for U.S. citizens.

appendixes

a. technical notes

b. statistical tables

appendix a

technical notes

This report presents statistics from several data sources. The following are primary references used for major portions of the analysis:

Section	*Source*	*Date range of statistics*
1.	Annual Census of Foreign Students, Institute of International Education (IIE)	1955-85
	Fall Enrollment and Compliance Report, and Degrees and Other Formal Awards Conferred, Center for Education Statistics (CES), Department of Education	1976-82
2.	Survey of Graduate Science and Engineering Students and Postdoctorates (GSESP), NSF	1977-84
3.	Survey of Earned Doctorates, NSF	1960-85
4.	Survey of Graduate Science and Engineering Students and Postdoctorates (GSESP), NSF	1979-85
5.	Several NSF data bases analyzed in the special report, *Foreign National Scientists and Engineers in the U.S. Labor Force, 1972-1982*, by Michael G. Finn, Oak Ridge Associated Universities, June 1985	1972, 1982
6.	*Scientists and Engineers From Abroad*, NSF, based on data of the Immigration and Naturalization Service, U.S. Department of Justice	1966-79 and 1982-84

Essential features of the primary data sources are presented here; additional technical information on surveys conducted by the National Science Foundation (NSF) is available from the Division of Science Resources Studies, NSF. Other non-NSF sources should be consulted directly.

annual census of foreign students

Annual surveys requesting information on foreign students are sent to all 2- and 4-year institutions with regional accreditation listed in the *Education Directory: Colleges and Universities* of the Department of Education. Numbers of institutions surveyed and response rates are summarized in table B-1. Response rates by type of institution and data elements are reviewed in the annual publication series, *Open Doors*, published by the Institute of International Education (IIE), 809 United Nations Plaza, New York, New York 10017.

Institutions are requested to report as a foreign student anyone who is enrolled for courses in the United States who is not a citizen and not an immigrant (permanent resident). Resident aliens, those holding "green cards," are not to be included in counts of foreign students. Countries included in IIE regions are shown in table A-1.

Table A-1. World regions and countries used to report data from Annual Census of Foreign Students by the Institute of International Education

AFRICA

Eastern Africa
Burundi
Comoros
Djibouti
Ethiopia
Kenya
Madagascar
Malawi
Mauritius
Mozambique
Réunion
Rwanda
Seychelles
Somalia
Tanzania
Uganda
Zambia
Zimbabwe

Central Africa
Angola
Cameroon
Central African Republic
Chad
Congo
Equatorial Guinea
Gabon
San Thomas and Prince Islands
Zaire

North Africa
Algeria
Canary Islands
Egypt
Libya
Morocco
Sudan
Tunisia
Western Sahara

Southern Africa
Botswana
Lesotho
Namibia
South Africa
Swaziland

West Africa
Benin
Bourkina Fasso
Cape Verde
Gambia
Ghana
Guinea
Guinea-Bissau
Ivory Coast
Liberia
Mali
Mauritania
Niger
Nigeria
St. Helena
Senegal
Sierra Leone
Togo

EUROPE

Eastern Europe
Albania
Bulgaria
Czechoslovakia
German
  Democratic Republic
Hungary
Poland
Romania
U.S.S.R.
Yugoslavia

Western Europe
Andorra
Austria
Belgium
Denmark
Faroe Islands
Finland
France
Germany,
  Federal Republic of
Gibraltar
Greece
Iceland
Ireland
Italy
Liechtenstein
Luxembourg
Malta
Monaco
Netherlands
Norway
Portugal
San Marino
Spain
Sweden
Switzerland
United Kingdom
Vatican City

LATIN AMERICA

Caribbean
Bahamas
Barbados
Cayman Islands
Cuba
Dominican Republic
Guadeloupe
Haiti
Jamaica
Leeward Islands
  Anguilla
  Antigua
  British Virgin Islands
  Montserrat
  St. Kitts-Nevis
Martinique
Netherlands Antilles
Trinidad & Tobago
Turks & Caicos Islands
Windward Islands
  Dominica
  Grenada
  St. Lucia
  St. Vincent

Central America
Belize
Costa Rica
El Salvador
Guatemala
Honduras
Mexico
Nicaragua
Panama

South America
Argentina
Bolivia
Brazil
Chile
Colombia
Ecuador
Falkland Islands
French Guiana
Guyana
Paraguay
Peru
Suriname
Uruguay
Venezuela

MIDDLE EAST

Bahrain
Cyprus
Iran
Iraq
Israel
Jordan
Kuwait
Lebanon
Oman
Qatar
Saudi Arabia
Syria
Turkey
United Arab Emirates
Yemen Arab Republic
Yemen, People's
  Democratic Republic of

NORTH AMERICA

Bermuda
Canada

OCEANIA

Australia & New Zealand
Australia
New Zealand

Pacific Ocean Island Areas
Cook Islands
Fiji
French Polynesia
Kiribati
Nauru
New Caledonia
Niue
Norfolk Island
Pacific Islands,
  Trust Territory of the
Papua New Guinea
Solomon Islands
Tonga
Tuvalu
Vanuatu
Wallis & Futuna Islands
Western Samoa

SOUTH AND EAST ASIA

East Asia
China
Hong Kong
Japan
Korea, Democratic
  People's Republic of
Korea, Republic of
Macao
Mongolia
Taiwan

South Central Asia
Afghanistan
Bangladesh
Bhutan
India
Maldives, Republic of
Nepal
Pakistan
Sikkim
Sri Lanka
Tibet

Southeast Asia
Brunei
Burma
Cambodia
Indonesia
Laos
Malaysia
Philippines
Portuguese Timor
Singapore
Thailand
Vietnam

SOURCE: *Open Doors: 1984/85*, Institute of International Education, 809 United Nations Plaza, New York, N.Y. 10017

fall enrollment and compliance report and degrees and other formal awards conferred

Surveys of students and recipients of earned degrees are part of the Higher Education General Information Survey (HEGIS) sent to all 2- and 4-year institutions with regional accreditation by the Center for Education Statistics (CES), Department of Education. These surveys have requested citizenship status on a biennial basis since 1976.

Institutions are requested to report as nonresident aliens all persons who are not citizens of the United States and do not have the right to remain indefinitely. Resident aliens who are not citizens or nationals of the United States but have been lawfully admitted for permanent residence are to be reported together with U.S. citizens.

survey of graduate science and engineering students and postdoctorates (GSESP)

Data from the fall Survey of Graduate Science and Engineering Students and Postdoctorates (GSESP) represent all academic institutions in the United States which granted doctorate- or master's-level degrees in any science or engineering (S/E) field. Institutions include data for their branch campuses, affiliated research centers, and separately organized components such as medical or dental schools, schools of nursing, public health, etc. The final 1985 survey universe consisted of 530 reporting units at 414 institutions. Of these, 440 reporting units were associated with 324 doctorate-granting institutions and 90 represented master's-granting institutions. Only 22 failed to respond. Within the responding institutions, 609 departments required total imputation and 649 required partial imputation (table A-2).

Institutions are requested to count as a foreign student any individual who has not attained U.S. citizenship, whether nonresident alien or holding a permanent visa; applicants for U.S. citizenship are considered as foreign until the date their citizenship becomes effective.

Additional information and detailed data are available from:

Science and Engineering Education Sector Studies Group
Division of Science Resources Studies
National Science Foundation
1800 G Street, N.W., Room L-602
Washington, D.C. 20550
(202) 634-4673

Table A-2. Imputation for nonresponse at doctorate-granting institutions by citizenship: 1985

	Total	United States	Foreign
Full-time graduate students	249,666	183,557	66,109
Number imputed	13,355	8,671	4,684
Percent imputed	5.3	4.7	7.1
Science/engineering postdoctorates	22,691	13,732	8,959
Number imputed	1,847	1,235	612
Percent imputed	8.1	9.0	6.8

SOURCE: National Science Foundation

survey of earned doctorates

The Survey of Earned Doctorates has been conducted annually by the National Academy of Sciences for the NSF and other Federal agencies since 1957. Information from this survey becomes part of the Doctorate Records File, which includes over 780,000 records for doctorates awarded since 1920 by regionally accredited universities and colleges. Doctoral degrees such as the Ph.D. or D.Sc. are included in these surveys, but first-professional degrees such as the J.D. or M.D. are not. Approximately 95 percent of the annual cohort of doctorate recipients respond to the questionnaire distributed to individuals through the cooperation of the Graduate Deans. Partial data from public sources are added to the file for nonrespondents. The data for a given year include all doctorates awarded in the 12-month period ending on June 30 of that year.

Respondents who are non-U.S. citizens are asked to report visa status and country of citizenship. Persons on both permanent (immigrant) and temporary visas are included in totals of foreign recipients. Countries included in regions for the Survey of Earned Doctorates are shown in table A-3.

The number of S/E doctor's degrees reported by the Survey of Earned Doctorates differs slightly from that reported by CES both because of the different suppliers of the data and because of differences in field classification systems. In addition, the NSF data on total degrees are restricted to research doctorates while those of CES may include nonresearch doctorates. Because the CES survey includes information on bachelor's, master's, and doctor's degrees, that source is appropriate for studying relationships among degree fields at different levels. The Survey of Earned Doctorates is better suited for describing the characteristics of doctorate recipients. The differences between the two data series have been generally consistent over the 1960-85 period.

Additional information and detailed data are available from:

Science and Engineering Education Sector Studies Group
Division of Science Resources Studies
National Science Foundation
1800 G Street, N.W., Room L-611
Washington, D.C. 20550
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Table A-3. World regions and countries used to report data from Survey of Earned Doctorates by the National Science Foundation

CANADA

MEXICO AND CENTRAL AMERICA

British Honduras
Costa Rica
El Salvador
Guatemala
Honduras
Mexico
Nicaragua
Panama
Central America, Unknown

CUBA AND ISLANDS

Bahamas
Barbados
Bermuda
Cuba
Dominican Republic
Guadeloupe
Haiti
Jamaica
Martinique
Netherlands Antilles
Trinidad and Tobago
Carribean Islands, Unknown

SOUTH AMERICA

Argentina
Bolivia
Brazil
Chile
Colombia
Ecuador
French Guiana
Guyana
Paraguay
Peru
Surinam
Uruguay
Venezuela
South America, Unknown

EUROPE, NORTHERN

Denmark
England
Finland
Iceland
Ireland, Northern
Ireland, Republic of
Ireland, Unspecified
Norway
Scotland
Sweden
Wales
Northern Europe, Unknown

EUROPE, CENTRAL

Austria
Germany, East
Germany, West
Germany, Unspecified
Italy
Liechtenstein
Malta
Central Europe, Unknown

EUROPE, EASTERN

Albania
Bulgaria
Czechoslovakia
Greece
Hungary
Poland
Romania
USSR, Estonia, Latvia and Lithuania
Yugoslavia
Eastern Europe, Unknown

EUROPE, WESTERN

Andorra
Belgium
France
Gibraltar
Luxembourg
Monaco
Netherlands, The
Portugal
Spain
Switzerland
Western Europe, Unknown

ASIA, EASTERN

Burma
China, Peoples Republic of
China, Republic of (Taiwan)
China, Unspecified
Hong Kong
Japan, Okinawa and Ryukyus
Khmer Republic
Korea, North
Korea, Republic of
Korea, Unspecified
Laos
Macao
Malaysia
Mongolian People's Republic
Singapore
Thailand (Siam)
Viet-Nam
Eastern Asia, Unknown

ASIA, WESTERN

Afghanistan
Bahrain
Bhutan
Cyprus
India
Iran
Iraq
Israel
Jordan
Palestine
Kuwait
Lebanon
Maldives, Republic of
Muscat and Oman

Table A-3. World regions and countries used to report data from Survey of Earned Doctorates by the National Science Foundation—Con.

Nepal
Bangladesh
Pakistan (1971 and after)
Pakistan (before 1971 and unspecified)
Qatar
Saudi Arabia
Sikkim
Sri Lanka (Ceylon)
Syrian Arab Republic
Turkey
United Arab Emirates
Yemen Arab Republic
Yemen, Peoples Republic of
Yemen, Unspecified
Western Asia, Unknown

AUSTRALASIA

Australia
Brunei
Fiji
French Austral Lands
French Polynesia
Indonesia, Republic of
Nauru
New Caledonia
New Guinea, Northeast
New Zealand
Papua
Philippines, Republic of the
Solomon Islands
Tonga
Western Samoa
Australasia, Unknown
Lesotho
Malagasy Republic (Madagascar)
Malawi
Mauritius
Mozambique
Rhodesia
Rwanda
Seychelles
South Africa, Republic of
South West Africa (Namibia)
Swaziland
Tanzania
Uganda
Zaire, Democratic Republic of
Zambia
South Africa, Unknown

WEST NORTH AFRICA

Algeria
Cameroon
Dahomey
Equatorial Guinea
Gambia, The
Ghana
Guinea
Ivory Coast
Liberia
Mali
Mauritania
Morocco
Niger
Nigeria
Portuguese Guinea
Senegal
Sierra Leone
Spanish Sahara
Togo
Tunisia
Upper Volta
West North Africa, Unknown

EAST NORTH AFRICA

Arab Republic of Egypt
Central African Republic
Chad
Ethiopia
French Terr. of Afars and Issas
Libyan Arab Republic
Somali Democratic Republic
Sudan, The
East North Africa, Unknown

SOUTH AFRICA

Angola
Botswana
Burundi
Congo, Peoples Republic of
Gabon
Kenya

SOURCE: National Research Council

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Academic year	Institutions surveyed	Institutions responding	Percent responding	Institutions reporting foreign students	Percent reporting foreign students	Institutions reporting no foreign students	Percent reporting no foreign students	Number of foreign students reported	Percent change from previous year
1954/55	2,855	2,642	92.5	1,629	61.7	1,013	38.3	34,232	NA
1955/56	2,970	2,615	88.0	1,630	62.3	985	37.7	36,494	6.6
1956/57	2,956	2,718	91.9	1,734	63.8	984	36.2	40,666	11.4
1957/58	2,864	2,528	88.3	1,801	71.2	727	28.8	43,391	6.7
1958/59	2,955	2,485	84.1	1,680	67.6	805	32.4	47,245	8.9
1959/60	3,008	2,520	83.8	1,712	67.9	808	32.1	48,486	2.6
1960/61	2,952	2,539	86.0	1,666	65.6	873	34.4	53,107	9.5
1961/62	2,966	2,499	84.3	1,798	71.9	701	28.1	58,086	9.4
1962/63	2,876	2,463	85.6	1,805	73.3	658	26.7	64,705	11.4
1963/64	2,871	2,441	85.0	1,805	73.9	636	26.1	74,814	15.6
1964/65	2,556	2,293	89.7	1,859	81.1	434	18.9	82,045	9.7
1965/66	2,634	2,240	85.0	1,755	78.3	485	21.7	82,709	.8
1966/67	2,615	2,211	84.6	1,797	81.3	414	18.7	100,262	21.2
1967/68	2,743	2,214	80.7	1,827	82.5	387	17.5	110,315	10.0
1968/69	2,835	2,168	76.5	1,846	85.1	322	14.9	121,362	10.0
1969/70	2,859	1,999	69.9	1,734	86.7	265	13.3	134,959	11.2
1970/71	2,729	1,940	71.1	1,748	90.1	192	9.9	144,708	7.2
1971/72	2,690	1,815	67.5	1,650	90.9	165	9.1	140,126	-3.2
1972/73	2,289	1,619	70.7	1,508	93.1	111	6.9	146,097	4.3
1973/74	2,112	1,434	67.9	1,359	94.8	75	5.2	151,066	3.4
1974/75	3,085	1,908	61.8	1,760	92.2	148	7.8	154,580	2.3
1975/76	3,065	2,261	73.8	2,093	92.6	168	7.4	179,344	16.0
1976/77	3,016	2,524	83.7	2,294	90.9	230	9.1	203,068	13.2
1977/78	3,053	2,738	89.7	2,475	90.4	263	9.6	235,509	16.0
1978/79	3,127	2,752	88.0	2,504	91.0	248	9.0	263,938	12.1
1979/80	3,186	2,950	92.6	2,651	89.9	299	10.1	286,343	8.5
1980/81	3,205	3,030	94.5	2,734	90.2	296	9.8	311,882	8.9
1981/82	2,862	2,693	94.1	2,454	91.1	239	8.9	326,299	4.6
1982/83	2,849	2,795	98.1	2,529	90.5	266	9.5	336,985	3.3
1983/84	2,844	2,766	97.3	2,498	90.3	268	9.7	338,894	.6
1984/85	2,833	2,766	97.6	2,492	90.1	274	9.9	342,113	.9
1985/86	2,902	2,803	96.6	2,507	89.4	296	10.6	343,777	.5

NOTE: NA – not applicable.

SOURCE: *Open Doors*, Institute of International Education, 809 United Nations Plaza, New York, N.Y. 10017

Table B-2. Region of origin of foreign students in the United States: 1954/55 to 1985/86

Academic year	Total[1]	Africa	Europe	Latin America	Middle East	North America	Oceania	South and East Asia
	Number							
1954/55	34,190	1,234	5,205	8,446	4,079	4,714	337	10,175
1955/56	36,468	1,231	5,504	8,474	4,239	5,042	353	11,625
1956/57	40,599	1,424	6,005	9,110	4,763	5,444	424	13,429
1957/58	43,314	1,515	6,837	9,212	5,115	5,354	495	14,786
1958/59	47,156	1,735	6,606	10,249	5,956	5,512	612	16,486
1959/60	48,393	1,959	6,392	9,428	6,477	5,761	568	17,808
1960/61	53,029	2,831	6,702	9,626	7,096	6,128	658	19,988
1961/62	57,958	3,930	6,833	9,915	7,394	6,639	796	22,451
1962/63	64,592	4,996	7,923	11,021	7,887	7,089	948	24,728
1963/64	74,664	6,144	9,348	12,882	8,980	8,548	1,080	27,682
1964/65	81,840	6,855	10,108	13,657	9,977	9,338	1,265	30,640
1965/66	82,562	6,896	10,226	13,998	9,895	9,851	1,325	30,371
1966/67	99,824	7,170	14,207	18,182	11,401	12,230	1,635	34,999
1967/68	108,859	6,901	15,556	21,908	11,903	12,236	1,683	38,672
1968/69	118,237	6,979	16,453	23,438	12,338	12,948	1,869	44,212
1969/70	130,925	7,607	18,524	24,991	13,278	13,415	2,077	51,033
1970/71	142,366	8,734	18,306	29,300	14,840	12,732	1,995	56,459
1971/72	136,242	9,592	16,219	28,832	14,651	10,541	2,131	54,276
1972/73	140,820	11,465	16,296	28,383	16,278	9,805	2,107	56,486
1973/74	145,463	12,937	15,539	30,276	18,381	8,883	2,375	57,072
1974/75	152,060	18,400	13,740	26,270	23,910	8,630	2,650	58,460
1975/76	178,560	25,290	14,400	29,280	32,590	9,720	2,740	64,540
1976/77	202,880	25,860	16,700	37,240	38,490	11,420	3,150	70,020
1977/78	235,410	29,560	19,310	38,840	57,210	12,920	3,810	73,760
1978/79	263,750	33,990	21,690	41,120	70,430	15,520	4,150	76,850
1979/80	286,170	36,180	22,570	42,280	83,700	15,570	4,140	81,730
1980/81	311,640	38,180	25,330	49,810	84,710	14,790	4,180	94,640
1981/82	326,020	41,660	28,990	55,360	74,390	15,460	4,000	106,160
1982/83	336,610	42,690	31,570	56,810	67,280	14,570	4,040	119,650
1983/84	338,590	41,690	31,860	52,350	60,660	15,670	4,090	132,270
1984/85	341,840	39,520	33,350	48,560	56,580	15,960	4,190	143,680
1985/86	343,780	34,190	34,310	45,480	52,720	16,030	4,030	156,830

Continued on next page

Table B-2. Region of origin of foreign students in the United States: 1954/55 to 1985/86—Con.

Academic year	Total	Africa	Europe	Latin America	Middle East	North America	Oceania	South and East Asia
	Percent distribution							
1954/55	100.0	3.6	15.2	24.7	11.9	13.8	1.0	29.8
1955/56	100.0	3.4	15.1	23.2	11.6	13.8	1.0	31.9
1956/57	100.0	3.5	14.8	22.4	11.7	13.4	1.0	33.1
1957/58	100.0	3.5	15.8	21.3	11.8	12.4	1.1	34.1
1958/59	100.0	3.7	14.0	21.7	12.6	11.7	1.3	35.0
1959/60	100.0	4.0	13.2	19.5	13.4	11.9	1.2	36.8
1960/61	100.0	5.3	12.6	18.2	13.4	11.6	1.2	37.7
1961/62	100.0	6.8	11.8	17.1	12.8	11.5	1.4	38.7
1962/63	100.0	7.7	12.3	17.1	12.2	11.0	1.5	38.3
1963/64	100.0	8.2	12.5	17.3	12.0	11.4	1.4	37.1
1964/65	100.0	8.4	12.4	16.7	12.2	11.4	1.5	37.4
1965/66	100.0	8.4	12.4	17.0	12.0	11.9	1.6	36.8
1966/67	100.0	7.2	14.2	18.2	11.4	12.3	1.6	35.1
1967/68	100.0	6.3	14.3	20.1	10.9	11.2	1.5	35.5
1968/69	100.0	5.9	13.9	19.8	10.4	11.0	1.6	37.4
1969/70	100.0	5.8	14.1	19.1	10.1	10.2	1.6	39.0
1970/71	100.0	6.1	12.9	20.6	10.4	8.9	1.4	39.7
1971/72	100.0	7.0	11.9	21.2	10.8	7.7	1.6	39.8
1972/73	100.0	8.1	11.6	20.2	11.6	7.0	1.5	40.1
1973/74	100.0	8.9	10.7	20.8	12.6	6.1	1.6	39.2
1974/75	100.0	12.1	9.0	17.3	15.7	5.7	1.7	38.4
1975/76	100.0	14.2	8.1	16.4	18.3	5.4	1.5	36.1
1976/77	100.0	12.7	8.2	18.4	19.0	5.6	1.6	34.5
1977/78	100.0	12.6	8.2	16.5	24.3	5.5	1.6	31.3
1978/79	100.0	12.9	8.2	15.6	26.7	5.9	1.6	29.1
1979/80	100.0	12.6	7.9	14.8	29.2	5.4	1.4	28.6
1980/81	100.0	12.3	8.1	16.0	27.2	4.7	1.3	30.4
1981/82	100.0	12.8	8.9	17.0	22.8	4.7	1.2	32.6
1982/83	100.0	12.7	9.4	16.9	20.0	4.3	1.2	35.5
1983/84	100.0	12.3	9.4	15.5	17.9	4.6	1.2	39.1
1984/85	100.0	11.6	9.8	14.2	16.6	4.7	1.2	42.0
1985/86	100.0	9.9	10.0	13.2	15.3	4.8	1.2	45.6

[1] Totals here are slightly less than totals in source; source totals include students classified as stateless and of unknown origin.

SOURCE: *Open Doors*, Institute of International Education, 809 United Nations Plaza, New York, N.Y. 10017

Table B-3. Major fields of study for foreign students: selected years

Field of study	Academic year							
	1954/55	1959/60	1964/65	1969/70	1975/76	1979/80	1984/85	1985/86
	Number of foreign students							
Total, all fields	34,232	48,486	82,045	134,959	179,340	286,340	342,110	343,780
Agriculture	1,199	1,615	3,211	3,667	5,270	8,750	7,540	7,400
Business and management	2,953	4,114	7,116	15,587	28,670	46,960	64,930	64,970
Education	1,457	2,483	3,999	7,779	9,790	12,340	12,140	11,680
Engineering	7,618	11,279	18,084	29,731	42,000	76,950	75,370	74,580
Fine and applied arts	1,997	2,417	3,946	6,297	8,320	14,350	18,210	17,780
Health sciences	3,184	3,685	4,918	5,969	7,180	10,950	13,410	13,880
Humanities	5,502	6,829	12,137	20,211	15,030	11,340	21,150	22,230
Mathematics and computer sciences	436	1,015	2,670	4,400	9,060	15,390	35,630	35,910
Physical and life sciences	3,681	6,261	11,731	17,006	23,910	21,880	25,960	26,830
Social sciences	5,041	6,782	12,609	17,272	20,730	22,530	27,210	27,210
Other	566	482	607	597	9,380	12,600	3,360	3,150
Intensive English language	—	—	—	—	—	12,170	17,260	18,060
Undeclared	—	—	—	—	—	20,130	19.940	20,100
No answer	598	1,524	1,017	6,443	—	—	—	—
	Percent distribution							
Total, all fields	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Agriculture	3.5	3.3	3.9	2.7	2.9	3.1	2.2	2.2
Business and management	8.6	8.5	8.7	11.5	16.0	16.4	19.0	18.9
Education	4.3	5.1	4.9	5.8	5.5	4.3	3.5	3.4
Engineering	22.3	23.3	22.0	22.0	23.4	26.9	22.0	21.7
Fine and applied arts	5.8	5.0	4.8	4.7	4.6	5.0	5.3	5.2
Health sciences	9.3	7.6	6.0	4.4	4.0	3.8	3.9	4.0
Humanities	16.1	14.1	14.8	15.0	8.4	4.0	6.2	6.5
Mathematics and computer sciences	1.3	2.1	3.3	3.3	5.1	5.4	10.4	10.4
Physical and life sciences	10.8	12.9	14.3	12.6	13.3	7.6	7.6	7.8
Social sciences	14.7	14.0	15.4	12.8	11.6	7.9	8.0	7.9
Other	1.7	1.0	.7	.4	5.2	4.4	1.0	.9
Intensive English language	.0	.0	.0	.0	.0	4.3	5.0	5.3
Undeclared	.0	.0	.0	.0	.0	7.0	5.8	5.8
No answer	1.7	3.1	1.2	4.8	.0	.0	.0	.0

SOURCE: *Open Doors*, Institute of International Education, 809 United Nations Plaza, New York, N.Y. 10017

Table B-4. Distribution of academic level for foreign students by field of study: selected years

Field of study[1] and year	Academic level (Percentages)			Number of students reported
	Undergraduate	Graduate	Other	
All fields				
1963/64	48.2	41.9	9.9	73,745
1969/70	47.4	45.3	7.3	128,516
1973/74	50.4	44.3	5.3	130,984
1979/80	58.1	36.2	5.7	150,878
1983/84	57.9	38.2	3.9	171,760
Agriculture				
1963/64	35.1	55.0	9.9	2,294
1969/70	28.6	65.0	6.4	3,667
1973/74	27.9	67.3	4.8	3,688
1979/80	44.5	53.1	2.4	4,494
1983/84	36.5	62.4	1.1	5,310
Business/management				
1963/64	59.0	31.4	9.6	6,262
1969/70	60.0	34.2	5.8	15,587
1973/74	65.1	32.7	2.2	18,963
1979/80	64.2	33.6	2.2	23,968
1983/84	70.8	27.6	1.6	35,715
Education				
1963/64	47.0	40.4	12.6	3,946
1969/70	44.2	50.0	5.8	7,779
1973/74	36.2	60.2	3.6	5,957
1979/80	41.4	56.7	1.9	7,161
1983/84	44.2	54.3	1.5	7,760
Engineering				
1963/64	58.3	36.6	5.1	16,549
1969/70	48.5	47.8	3.7	29,731
1973/74	51.2	45.1	3.7	31,187
1979/80	69.7	29.1	1.2	37,786
1983/84	58.5	40.4	1.1	42,045

Table B-4. Distribution of academic level for foreign students by field of study: selected years—Con.

Field of study[1] and year	Academic level (Percentages)			Number of students reported
	Undergraduate	Graduate	Other	
Health				
1963/64	45.3	41.6	13.1	4,989
1969/70	51.4	39.9	8.7	5,969
1973/74	67.7	29.6	2.7	8,588
1979/80	58.2	39.5	2.3	5,926
1983/84	55.6	42.7	1.7	8,802
Humanities[1]				
1963/64	52.0	28.7	19.3	14,602
1969/70	55.1	29.4	15.5	26,508
1973/74	55.3	30.2	14.5	26,034
1979/80	63.0	32.3	4.7	14,297
1983/84	47.6	48.9	3.5	12,328
Physical/life sciences[1]				
1963/64	35.5	59.9	4.6	13,129
1969/70	33.7	62.3	4.0	21,406
1973/74	37.4	60.4	2.2	19,878
1979/80	46.6	51.3	2.1	15,655
1983/84	50.8	47.8	1.4	32,945
Social sciences[1]				
1963/64	40.2	52.0	7.8	11,330
1969/70	42.2	51.2	6.6	17,272
1973/74	40.0	57.1	2.9	16,419
1979/80	44.5	53.0	2.5	15,144
1983/84	62.9	28.7	8.4	7,378
Other[1]				
1963/64	76.1	4.2	19.7	644
1969/70	80.7	5.5	13.8	597
1973/74	80.6	11.9	7.5	520
1979/80	53.3	9.8	36.9	22,224
1983/84	61.6	18.5	19.9	19,477

[1] Field-of-study categories in this table are from 1963-1974 and differ from those currently in use. The Humanities category includes data for architecture, fine arts, and liberal arts; Physical/Life Sciences includes math and computer science; Social Sciences includes home economics and law; and "Other" includes Intensive English students and those with undeclared fields. 1979/80 and 1983/84 survey data have been adjusted to be compatible to these categories.

SOURCE: *Profiles: The Foreign Student in the United States, 1983/84.* Institute of International Education, 809 United Nations Plaza, New York, N.Y. 10017

Table B-5. Fall enrollment of all students and nonresident aliens in institutions of higher education by level and discipline division: 1976, 1978, 1980, and 1982

Level and selected discipline divisions	1976			1978			1980			1982[1]		
	All students	Non-resident aliens	Percent of total	All students	Non-resident aliens	Percent of total	All students	Non-resident aliens	Percent of total	All students	Non-resident aliens	Percent of total
Undergraduate												
Total, all fields	8,524,614	129,836	1.5	8,700,242	155,339	1.8	9,380,080	190,620	2.0	9,301,454	193,870	2.1
Agriculture	136,472	1,871	1.4	126,872	2,371	1.9	125,102	2,743	2.2	[2]	[2]	—
Biological sciences	269,980	4,690	1.7	252,777	5,056	2.0	233,293	5,268	2.3	191,342	4,732	2.5
Engineering	384,469	24,374	6.3	451,180	33,081	7.3	540,875	38,526	7.1	449,768	32,301	7.2
Mathematics	[3]	[3]	—	[3]	[3]	[3]	[3]	[3]	—	64,573	2,782	4.3
Physical sciences	124,548	3,503	2.8	123,980	3,873	3.1	133,738	4,318	3.2	115,765	4,124	3.6
All others	7,609,145	95,398	1.3	7,745,433	110,958	1.4	8,347,072	139,765	1.7	8,480,006	149,931	1.8
Graduate												
Total, all fields	1,086,334	66,308	6.1	1,076,980	73,628	6.8	1,102,373	86,170	7.8	1,020,148	95,005	9.3
Agriculture	15,510	2,983	19.2	16,923	3,402	20.1	16,516	3,513	21.3	[2]	[2]	—
Biological sciences	42,746	3,226	7.5	41,785	3,187	7.6	38,857	3,185	8.2	35,911	3,725	10.4
Engineering	58,706	13,469	22.9	57,123	15,190	26.6	62,793	18,056	28.8	66,847	20,506	30.7
Mathematics	[3]	[3]	—	[3]	[3]	—	[3]	[3]	—	11,569	3,150	27.2
Physical sciences	35,153	5,182	14.7	35,279	5,641	16.0	36,046	6,288	17.4	35,086	7,155	20.4
All others	934,219	41,448	4.4	925,870	46,208	5.0	948,161	55,128	5.8	870,735	60,469	6.9

[1] Data for 1982 are incomplete but do include 3,242 out of 3,327 institutions in the aggregate United States.

[2] Data for agriculture not collected in 1982.

[3] Data for mathematics not collected prior to 1982.

NOTE: Nonresident aliens include only non-U.S. citizens holding temporary visas.

SOURCES: Department of Education, Center for Education Statistics; and Office for Civil Rights

Table B-6. Engineering enrollments by program: fall 1983

Program	Full-time students					
	Undergraduates			Graduates		
	All students	Foreign nationals	Foreign as a percent of total	All students	Foreign nationals	Foreign as a percent of total
Total	405,832	24,882	6.1	57,180	19,599	34.3
Aerospace	14,115	546	3.9	1,804	569	31.5
Agricultural	2,895	131	4.5	682	203	29.8
Architectural	2,377	192	8.1	114	45	39.5
Bioengineering	3,747	101	2.7	979	150	15.3
Ceramic	1,034	6	.6	248	46	18.5
Chemical	33,215	1,478	4.4	6,108	1,848	30.3
Civil	38,857	4,665	12.0	7,688	3,045	39.6
Computer	22,424	1,220	5.4	3,768	1,363	36.2
Electrical	106,240	7,675	7.2	13,243	4,474	33.8
Engineering science	5,953	380	6.4	1,910	543	28.4
Environmental	956	39	4.1	978	199	20.3
General	56,112	2,080	3.7	1,732	438	25.3
Industrial	14,153	1,044	7.4	2,778	1,097	39.5
Marine	2,847	135	4.7	712	249	35.0
Materials and metallurgy	3,777	124	3.3	2,395	948	39.0
Mechanical	71,459	3,654	5.1	8,621	3,343	33.8
Mining	4,004	154	3.8	894	227	25.4
Nuclear	2,071	77	3.7	1,050	373	16.0
Petroleum	7,406	597	3.1	625	203	32.5
Pre-engineering	8,944	457	5.1	—	—	—
Systems	2,443	77	3.2	851	231	17.1

SOURCE: *Engineering & Technology Enrollments: Fall 1983*, Engineering Manpower Commission of the American Association of Engineering Societies, Inc., 1984

Table B-7. Degree awards to nonresident aliens in science/engineering fields by degree: 1976, 1979, 1981, and 1983

Selected discipline divisions	1976			1979			1981			1983		
	All students	Non-resident aliens	Percent of total	All students	Non-resident aliens	Percent of total	All students	Non-resident aliens	Percent of total	All students	Non-resident aliens	Percent of total
	Bachelor's											
Total, all fields . .	918,388	15,012	1.6	916,347	17,831	1.9	931,583	22,573	2.4	997,258	26,394	2.6
Science and engineering	336,949	7,773	2.3	327,043	9,740	3.0	329,871	12,891	3.9	332,038	12,571	3.8
Agriculture	19,399	308	1.6	23,134	479	2.1	21,886	616	2.8	21,024	695	3.3
Biological sciences	54,100	938	1.7	48,794	887	1.8	43,166	901	2.1	40,883	919	2.2
Computer/ Information sciences	5,570	217	3.9	8,693	376	4.3	15,081	777	5.2	24,682	1,239	5.0
Engineering	45,473	3,171	7.0	61,426	4,760	7.7	74,092	6,954	9.4	72,668	5,613	7.7
Mathematics . . .	15,816	306	1.9	11,740	364	3.1	10,932	455	4.1	12,557	619	4.9
Physical sciences	21,225	520	2.4	22,861	693	3.0	23,610	729	3.1	23,497	746	3.2
Psychology	49,546	494	1.0	42,395	445	1.0	40,783	484	1.2	40,825	597	1.5
Social sciences	125,820	1,819	1.4	108,000	1,736	1.6	100,321	1,975	2.0	95,902	2,143	2.2
	Master's											
Total, all fields . .	309,263	16,074	5.2	299,887	19,405	6.5	294,182	22,057	7.5	300,561	24,748	8.2
Science and engineering	61,089	7,197	11.8	58,370	8,443	14.5	58,188	9,660	16.6	61,853	11,297	18.3
Agriculture	3,311	559	16.9	3,994	725	18.2	4,003	710	17.7	4,272	855	20.0
Biological sciences	6,569	408	6.2	6,831	464	6.8	5,977	368	6.2	5,735	428	7.5
Computer/ Information sciences	2,524	315	12.5	2,980	465	15.6	4,143	904	21.8	5,321	1,172	22.0
Engineering	15,907	3,492	22.0	15,239	3,952	25.9	16,358	4,563	27.9	18,842	5,179	27.5
Mathematics . . .	3,846	300	7.8	3,033	472	15.6	2,565	464	18.1	2,839	660	23.2
Physical sciences	5,384	637	11.8	5,406	706	13.1	5,227	786	15.0	5,288	790	14.9
Psychology	7,781	193	2.5	8,000	163	2.0	7,998	270	3.4	8,439	397	4.7
Social sciences	15,767	1,293	8.2	12,887	1,496	11.6	11,917	1,595	13.4	11,117	1,816	16.3
	Doctor's											
Total, all fields . .	33,787	4,068	12.0	32,664	3,915	12.0	32,839	4,203	12.8	33,695	4,623	13.7
Science and engineering	18,290	2,997	16.4	17,073	2,678	15.7	17,530	2,855	16.3	17,597	3,125	17.8
Agriculture	916	264	28.8	950	268	28.2	1,067	343	32.1	1,149	283	24.6
Biological sciences	3,388	361	10.7	3,542	343	9.7	3,718	289	7.8	3,345	293	8.6
Computer/ Information sciences	244	46	18.9	236	48	20.3	252	52	20.6	262	64	24.4
Engineering	2,789	974	34.9	2,491	867	34.8	2,551	956	37.5	2,822	1,157	41.0
Mathematics . . .	853	161	18.9	730	162	22.2	728	173	23.8	698	193	27.6
Physical sciences	3,417	578	16.9	3,102	487	15.7	3,140	530	16.9	3,270	557	17.0
Psychology	2,564	92	3.6	2,662	74	2.8	2,955	94	3.2	3,120	121	38.8
Social sciences	4,119	521	12.6	3,360	429	12.8	3,119	418	13.4	2,931	457	15.6

NOTE: Nonresident aliens include only these non-U.S. citizens holding temporary visas.

SOURCE: Department of Education, Center for Education Statistics, unpublished tabulations

Table B-8. Distribution of primary sources of funds for foreign students attending 4-year colleges: 1979/80, 1982/83, 1983/84, 1984/85, and 1985/86

Primary source of funds	Percentage of foreign students reported				
	1979/80	1982/83	1983/84	1984/85	1985/86
Total	100.0	100.0	100.0	100.0	100.0
Personal and family	63.1	65.4	63.1	66.2	67.1
Home government	13.7	13.6	13.3	12.0	11.1
Foreign private sponsor	3.1	2.9	2.8	2.9	2.3
College or university	11.4	10.5	11.3	11.6	12.5
Employment	2.0	2.5	2.5	2.1	2.0
U.S. Government	1.9	1.8	2.4	2.1	2.0
U.S. private sponsor	2.1	1.8	2.0	1.9	2.2
Other	2.7	1.5	2.1	1.1	.8

SOURCE: *Open Doors*, 1979/80, 1982/83, 1983/84, 1984/85, and 1985/86 edit, Institute of International Education, 809 United Nations Plaza, New York, N.Y. 10017

Table B-9. Science/engineering graduate students in all institutions by field, citizenship, racial/ethnic background, and enrollment status: 1980 and 1982-1985

FIELD, CITIZENSHIP, AND RACIAL/ETHNIC BACKGROUND	FULL TIME					PART TIME 1/				
	1980	1982	1983	1984	1985	1980	1982	1983	1984	1985
TOTAL, ALL FIELDS:	249,159	255,297	263,750	267,451	269,319	133,941	143,685	149,697	159,364	165,517
TOTAL US CITIZENS	198,429	197,374	200,966	203,167	200,490	-	133,190	138,119	147,063	153,391
BLACK, NON-HISPANIC	6,607	7,225	7,474	7,618	7,176	5,020	6,100	7,005	7,254	7,355
AMERICAN INDIAN/ALASKAN NATIVE	661	712	774	740	661	254	464	446	424	379
ASIAN/PACIFIC ISLANDER	5,394	5,657	6,460	7,456	8,477	2,830	3,678	4,200	4,845	5,822
HISPANIC	4,922	5,496	6,486	6,857	6,725	2,490	3,830	4,683	5,191	4,785
WHITE, NON-HISPANIC	149,481	159,171	168,096	166,580	162,447	79,174	102,410	108,815	111,474	115,886
OTHER OR UNKNOWN	31,364	19,113	11,676	13,916	15,003	-	16,708	12,970	17,876	19,164
FOREIGN	50,730	57,923	62,784	64,284	68,829	-	10,495	11,578	12,300	12,125
ENGINEERING:	43,107	50,239	55,193	56,581	57,524	31,977	34,355	37,962	40,239	42,844
TOTAL US CITIZENS	25,108	28,816	32,147	33,023	33,129	-	30,569	33,173	35,330	37,861
BLACK, NON-HISPANIC	472	519	666	710	725	458	625	753	832	789
AMERICAN INDIAN/ALASKAN NATIVE	26	76	101	122	75	49	95	84	85	55
ASIAN/PACIFIC ISLANDER	1,506	1,419	1,759	2,210	2,626	1,204	1,328	1,703	2,003	2,477
HISPANIC	572	601	785	775	784	512	500	710	879	819
WHITE, NON-HISPANIC	18,603	21,677	25,196	25,635	25,405	18,371	21,699	24,786	25,788	27,377
OTHER OR UNKNOWN	3,929	4,524	3,640	3,571	3,514	-	6,322	5,137	5,743	6,345
FOREIGN	17,999	21,423	23,046	23,558	24,395	-	3,786	4,789	4,909	4,983
SCIENCES, TOTAL:	206,052	205,058	208,557	210,869	211,796	101,964	109,330	111,735	119,125	122,672
TOTAL US CITIZENS	173,321	168,558	168,819	170,144	167,362	-	102,621	104,946	111,733	115,530
BLACK, NON-HISPANIC	6,135	6,706	6,808	6,908	6,450	4,562	5,475	6,252	6,422	6,566
AMERICAN INDIAN/ALASKAN NATIVE	635	636	673	618	587	205	369	362	339	324
ASIAN/PACIFIC ISLANDER	3,888	4,238	4,701	5,246	5,851	1,626	2,350	2,497	2,842	3,346
HISPANIC	4,350	4,895	5,701	6,082	5,942	1,978	3,330	3,973	4,312	3,966
WHITE, NON-HISPANIC	130,878	137,494	142,900	140,945	137,042	60,803	80,711	84,029	85,685	88,509
OTHER OR UNKNOWN	27,435	14,589	8,036	10,345	11,489	-	10,386	7,833	12,133	12,819
FOREIGN	32,731	36,500	39,738	40,726	44,434	-	6,709	6,789	7,392	7,143
PHYSICAL SCIENCES:	22,918	24,040	25,213	25,874	26,720	4,034	4,159	4,262	4,613	4,581
TOTAL US CITIZENS	17,174	17,555	17,981	18,333	18,222	-	3,699	3,832	4,150	4,110
BLACK, NON-HISPANIC	323	418	412	438	392	96	135	163	173	164
AMERICAN INDIAN/ALASKAN NATIVE	13	32	40	66	34	1	18	5	20	9
ASIAN/PACIFIC ISLANDER	513	532	590	751	791	113	165	159	183	184
HISPANIC	305	387	449	461	526	65	109	114	80	78
WHITE, NON-HISPANIC	13,919	14,742	15,478	15,311	15,242	2,404	2,947	3,185	3,415	3,323
OTHER OR UNKNOWN	2,101	1,444	1,012	1,305	1,237	-	325	206	278	352
FOREIGN	5,744	6,485	7,232	7,541	8,498	-	460	430	464	471
ENVIRONMENTAL SCIENCES:	10,969	11,436	12,089	11,714	11,557	3,239	3,738	3,520	4,088	4,451
TOTAL US CITIZENS	9,570	9,789	10,391	10,151	9,862	-	3,501	3,343	3,870	4,237
BLACK, NON-HISPANIC	66	76	83	86	85	38	27	29	26	43
AMERICAN INDIAN/ALASKAN NATIVE	38	17	24	18	18	0	5	3	5	4
ASIAN/PACIFIC ISLANDER	143	136	158	148	157	27	72	85	45	35
HISPANIC	115	132	146	197	209	34	59	81	74	76
WHITE, NON-HISPANIC	7,523	8,388	9,348	8,701	8,471	2,230	3,005	3,023	3,416	3,465
OTHER OR UNKNOWN	1,685	1,040	632	1,001	922	-	333	122	303	615
FOREIGN	1,399	1,647	1,698	1,564	1,695	-	237	177	218	214
MATHEMATICAL SCIENCES:	9,902	10,823	10,971	11,432	11,975	5,458	6,376	6,472	6,400	6,149
TOTAL US CITIZENS	6,648	6,935	6,726	6,879	7,083	-	5,733	5,756	5,708	5,602
BLACK, NON-HISPANIC	141	174	164	185	199	159	183	240	215	224
AMERICAN INDIAN/ALASKAN NATIVE	25	20	12	4	5	13	22	21	27	22
ASIAN/PACIFIC ISLANDER	205	298	337	322	435	119	194	227	310	257
HISPANIC	140	174	205	185	163	50	116	127	113	104
WHITE, NON-HISPANIC	5,042	5,571	5,589	5,562	5,679	3,034	4,587	4,742	4,424	4,196
OTHER OR UNKNOWN	1,095	698	419	620	601	-	631	399	618	800
FOREIGN	3,254	3,888	4,245	4,553	4,892	-	643	716	691	546
COMPUTER SCIENCES:	6,587	9,171	10,687	11,328	14,076	6,991	10,641	12,929	14,036	15,350
TOTAL US CITIZENS	4,521	5,981	6,724	6,905	8,715	-	9,458	11,344	12,230	13,568
BLACK, NON-HISPANIC	67	198	207	193	192	126	330	357	335	387
AMERICAN INDIAN/ALASKAN NATIVE	7	15	11	38	46	4	16	11	10	9
ASIAN/PACIFIC ISLANDER	200	365	558	534	885	369	525	541	616	1,033
HISPANIC	42	105	105	111	144	58	144	177	149	244
WHITE, NON-HISPANIC	2,793	4,339	5,053	5,209	5,865	3,758	7,235	8,429	8,430	9,202
OTHER OR UNKNOWN	1,412	959	790	821	1,584	-	1,205	1,829	2,692	2,693
FOREIGN	2,066	3,190	3,963	4,423	5,362	-	1,183	1,585	1,806	1,783

See footnotes at end of table.

Table B-9. Science/engineering graduate students in all institutions by field, citizenship, racial/ethnic background, and enrollment status: 1980 and 1982-1985—continued

FIELD, CITIZENSHIP, AND RACIAL/ETHNIC BACKGROUND	FULL TIME					PART TIME 1/				
	1980	1982	1983	1984	1985	1980	1982	1983	1984	1985
LIFE SCIENCES, TOTAL:	72,409	70,254	70,161	70,458	70,301	30,095	32,635	33,608	35,201	36,961
TOTAL US CITIZENS	63,543	60,522	59,740	59,705	58,900	-	31,106	32,175	33,635	35,411
BLACK, NON-HISPANIC	1,633	1,697	1,735	1,739	1,833	1,078	1,244	1,532	1,681	1,797
AMERICAN INDIAN/ALASKAN NATIVE	172	191	222	179	195	68	96	122	98	83
ASIAN/PACIFIC ISLANDER	1,644	1,622	1,694	1,870	2,036	457	603	679	729	852
HISPANIC	1,451	1,338	1,776	1,817	2,099	521	603	811	810	983
WHITE, NON-HISPANIC	50,716	51,880	52,559	52,210	50,351	20,476	26,344	27,451	28,149	28,912
OTHER OR UNKNOWN	7,927	3,794	1,754	1,889	2,387	-	2,216	1,580	2,167	2,783
FOREIGN	8,866	9,732	10,421	10,753	11,401	-	1,529	1,433	1,566	1,550
AGRICULTURAL SCIENCES:	9,980	9,891	9,836	9,776	9,120	2,274	2,423	2,454	2,289	2,354
TOTAL US CITIZENS	7,754	7,508	7,368	7,331	6,806	-	2,206	2,230	2,077	2,088
BLACK, NON-HISPANIC	91	123	112	107	119	17	22	21	30	49
AMERICAN INDIAN/ALASKAN NATIVE	19	12	20	17	16	0	13	12	4	4
ASIAN/PACIFIC ISLANDER	125	117	113	147	146	20	21	20	15	36
HISPANIC	221	164	182	214	288	64	46	41	80	115
WHITE, NON-HISPANIC	6,269	6,556	6,690	6,730	5,995	1,443	1,948	1,977	1,770	1,729
OTHER OR UNKNOWN	1,029	536	251	116	242	-	156	159	178	155
FOREIGN	2,226	2,383	2,468	2,445	2,314	-	217	224	212	266
BIOLOGICAL SCIENCES:	37,928	36,989	37,110	37,795	37,916	9,962	9,321	8,981	9,319	9,962
TOTAL US CITIZENS	33,340	31,950	31,586	31,917	31,450	-	8,742	8,426	8,658	9,342
BLACK, NON-HISPANIC	715	784	841	814	825	267	344	332	345	427
AMERICAN INDIAN/ALASKAN NATIVE	48	67	90	69	93	8	25	31	19	16
ASIAN/PACIFIC ISLANDER	937	906	1,025	1,142	1,312	178	225	250	240	301
HISPANIC	609	618	720	695	788	159	192	192	156	202
WHITE, NON-HISPANIC	27,047	27,761	28,027	28,313	27,429	6,633	7,082	7,008	7,088	7,564
OTHER OR UNKNOWN	3,984	1,814	883	883	1,002	-	874	613	809	831
FOREIGN	4,588	5,039	5,524	5,878	6,466	-	579	555	661	620
HEALTH SCIENCES:	24,501	23,374	23,215	22,886	23,265	17,859	20,891	22,173	23,593	24,645
TOTAL US CITIZENS	22,449	21,064	20,786	20,457	20,644	-	20,158	21,519	22,900	23,980
BLACK, NON-HISPANIC	827	790	782	818	889	794	878	1,179	1,306	1,321
AMERICAN INDIAN/ALASKAN NATIVE	105	112	112	92	86	60	58	79	75	63
ASIAN/PACIFIC ISLANDER	582	599	556	581	578	259	357	409	474	515
HISPANIC	621	556	874	908	1,023	298	365	578	574	666
WHITE, NON-HISPANIC	17,400	17,563	17,842	17,167	16,926	12,400	17,314	18,466	19,291	19,619
OTHER OR UNKNOWN	2,914	1,444	620	890	1,142	-	1,186	808	1,180	1,797
FOREIGN	2,052	2,310	2,429	2,430	2,621	-	733	654	693	664
PSYCHOLOGY:	26,692	25,818	26,759	27,077	26,393	13,944	14,280	14,370	17,533	17,935
TOTAL US CITIZENS	25,482	24,739	25,667	25,993	25,163	-	13,965	14,030	17,159	17,565
BLACK, NON-HISPANIC	1,017	1,021	1,145	1,172	1,111	401	622	771	1,040	989
AMERICAN INDIAN/ALASKAN NATIVE	185	78	92	87	94	48	61	44	46	62
ASIAN/PACIFIC ISLANDER	302	319	368	461	431	70	122	164	236	262
HISPANIC	971	1,032	1,146	1,390	1,050	327	439	684	1,206	732
WHITE, NON-HISPANIC	17,612	19,198	21,379	20,757	20,521	7,124	11,123	11,347	12,735	13,944
OTHER OR UNKNOWN	5,395	3,091	1,537	2,125	1,957	-	1,598	1,020	1,896	1,576
FOREIGN	1,210	1,079	1,092	1,084	1,230	-	315	340	374	370
SOCIAL SCIENCES:	56,575	53,516	52,677	52,987	50,774	38,203	37,501	36,574	37,255	37,246
TOTAL US CITIZENS	46,383	43,037	41,590	42,178	39,417	-	35,159	34,466	34,982	35,037
BLACK, NON-HISPANIC	2,888	3,122	3,062	3,095	2,639	2,664	2,934	3,160	2,951	2,962
AMERICAN INDIAN/ALASKAN NATIVE	195	283	272	226	195	71	151	156	132	135
ASIAN/PACIFIC ISLANDER	881	966	996	1,159	1,117	471	669	642	723	723
HISPANIC	1,326	1,727	1,874	1,920	1,751	923	1,860	1,979	1,880	1,749
WHITE, NON-HISPANIC	33,273	33,376	33,494	33,196	30,913	21,777	25,470	25,852	25,117	25,468
OTHER OR UNKNOWN	7,820	3,563	1,892	2,582	2,802	-	4,075	2,677	4,179	4,000
FOREIGN	10,192	10,479	11,087	10,809	11,357	-	2,342	2,108	2,273	2,208

1/ FOR PART-TIME STUDENTS, DISTRIBUTION BY CITIZENSHIP WAS NOT REQUESTED PRIOR TO 1982.
SOURCE: NATIONAL SCIENCE FOUNDATION

Table B-10. Full-time science/engineering graduate students in all institutions by field, level of study, citizenship, sex, and type of control: 1985

FIELD	TOTAL	LEVEL OF STUDY		CITIZENSHIP		SEX		TYPE OF CONTROL	
		FIRST YEAR	BEYOND FIRST YEAR	U.S.	FOREIGN	MEN	WOMEN	PUBLIC	PRIVATE
TOTAL, ALL FIELDS	269,319	85,498	183,821	200,490	68,829	175,253	94,066	193,869	75,450
ENGINEERING	57,524	18,757	38,766	33,129	24,395	50,797	6,727	39,964	17,560
AEROSPACE	1,995	720	1,275	1,258	737	1,871	124	1,476	519
AGRICULTURAL	767	238	529	414	353	709	58	714	53
BIOMEDICAL	1,129	359	770	935	194	884	245	657	472
CHEMICAL	5,566	1,523	4,043	3,352	2,214	4,807	759	3,825	1,741
CIVIL	10,229	3,711	6,518	5,699	4,530	8,588	1,641	7,602	2,627
ELECTRICAL	14,868	4,871	9,996	8,157	6,711	13,656	1,212	9,719	5,148
ENGINEERING SCIENCE	1,331	358	973	851	480	1,198	133	672	659
INDUSTRIAL	4,522	1,613	2,909	2,689	1,834	3,617	906	3,148	1,375
MECHANICAL	8,722	2,957	5,765	4,771	3,951	8,161	561	6,259	2,463
METALLURGICAL/MATERIALS	3,087	791	2,297	1,801	1,287	2,650	437	1,926	1,161
MINING	391	116	275	256	135	363	28	331	60
NUCLEAR	1,030	274	756	600	430	939	91	820	210
PETROLEUM	577	132	445	327	250	530	47	430	147
ENGINEERING, N.E.C.	3,310	1,094	2,216	2,020	1,291	2,825	486	2,385	925
SCIENCES, TOTAL	211,796	66,740	145,055	167,362	44,434	124,456	87,339	153,905	57,890
PHYSICAL SCIENCES	26,720	6,667	20,052	18,222	8,498	21,281	5,438	19,067	7,653
ASTRONOMY	635	155	480	485	150	531	104	410	225
CHEMISTRY	15,639	3,917	11,722	11,521	4,118	11,639	4,000	11,410	4,230
PHYSICS	10,271	2,533	7,738	6,067	4,204	8,989	1,282	7,096	3,175
PHYSICAL SCIENCES, N.E.C.	175	62	112	149	25	123	52	152	23
ENVIRONMENTAL SCIENCES	11,557	3,287	8,271	9,862	1,695	8,621	2,936	9,556	2,001
ATMOSPHERIC SCIENCES	872	286	586	676	196	733	139	819	53
GEOSCIENCES	7,744	2,118	5,626	6,795	948	5,847	1,897	6,232	1,512
OCEANOGRAPHY	1,686	421	1,265	1,374	312	1,180	506	1,381	305
ENVIRONMENTAL SCIENCES, N.E.C.	1,256	462	794	1,017	239	862	394	1,125	131
MATHEMATICAL SCIENCES	11,975	4,048	7,927	7,083	4,892	8,701	3,274	9,018	2,957
COMPUTER SCIENCES	14,076	4,676	9,401	8,715	5,362	11,035	3,041	9,815	4,262
LIFE SCIENCES	70,301	21,853	48,448	58,900	11,401	36,037	34,264	54,630	15,671
AGRICULTURAL SCIENCES	9,120	2,400	6,720	6,806	2,314	6,738	2,382	8,815	305
BIOLOGICAL SCIENCES	37,916	9,946	27,970	31,450	6,466	22,349	15,566	27,959	9,957
ANATOMY	903	200	703	811	92	517	386	585	318
BIOCHEMISTRY	4,491	1,092	3,399	3,515	976	2,829	1,662	3,100	1,391
BIOLOGY	8,893	2,509	6,384	7,737	1,156	5,271	3,622	6,215	2,678
BIOMETRY/EPIDEMIOLOGY	996	367	629	823	173	458	538	527	469
BIOPHYSICS	407	72	335	312	95	306	101	230	177
BOTANY	2,858	675	2,184	2,225	633	1,808	1,051	2,656	203
CELL BIOLOGY	1,472	355	1,117	1,275	197	938	534	759	713
ECOLOGY	869	202	667	769	100	556	313	817	52
ENTOMOLOGY/PARASITOLOGY	1,155	249	906	919	236	868	287	1,104	51
GENETICS	1,014	247	767	851	163	565	449	752	262
MICROBIOLOGY	3,891	954	2,937	3,241	650	2,242	1,649	2,933	958
NUTRITION	3,114	950	2,164	2,165	949	1,136	1,978	2,479	635
PATHOLOGY	1,054	261	793	864	190	642	412	725	329
PHARMACOLOGY	1,996	497	1,499	1,746	250	1,238	758	1,345	651
PHYSIOLOGY	1,998	630	1,368	1,733	265	1,253	745	1,346	652
ZOOLOGY	1,773	410	1,363	1,588	185	1,142	631	1,666	107
BIOSCIENCES, N.E.C.	1,032	277	755	876	156	581	451	720	312
HEALTH SCIENCES	23;265	9,507	13,758	20,644	2,621	6,950	16,316	17,856	5,409
DENTISTRY	745	314	431	590	155	584	161	514	231
NEUROLOGY	335	91	244	301	34	206	129	202	133
NURSING	5,851	2,461	3,389	5,680	171	274	5,577	4,397	1,454
PHARMACEUTICAL SCIENCES	1,826	456	1,370	1,159	667	1,217	609	1,562	264
PREVENTIVE MEDICINE/ COMMUNITY HEALTH	3,932	2,022	1,910	3,149	783	1,641	2,291	2,706	1,226
SPEECH PATHOLOGY/AUDIOLOGY	5,253	2,257	2,996	5,030	223	748	4,505	4,375	878
VETERINARY SCIENCES	512	127	385	379	133	326	186	429	83
CLINICAL MEDICINE, N.E.C.	1,160	387	773	967	193	594	566	784	376
HEALTH RELATED, N.E.C.	3,652	1,392	2,260	3,389	262	1,360	2,292	2,887	764
PSYCHOLOGY	26,393	8,100	18,293	25,163	1,230	10,577	15,817	16,755	9,639
SOCIAL SCIENCES	50,774	18,110	32,664	39,417	11,357	28,204	22,570	35,065	15,708
AGRICULTURAL ECONOMICS	1,985	661	1,324	1,219	766	1,550	435	1,887	98
ANTHROPOLOGY	3,912	981	2,931	3,464	448	1,793	2,119	2,755	1,157
ECONOMICS (EXCEPT AGRICULTURAL)	8,982	2,690	6,291	5,055	3,926	6,889	2,093	5,877	3,105
GEOGRAPHY	2,191	734	1,457	1,824	367	1,480	711	1,998	193
HISTORY AND PHILOSOPHY OF SCIENCE	265	70	195	208	57	178	87	149	116
LINGUISTICS	2,352	722	1,630	1,432	920	995	1,357	1,517	835
POLITICAL SCIENCE	12,451	4,956	7,495	10,051	2,401	7,963	4,488	7,213	5,239
SOCIOLOGY	4,708	1,181	3,527	3,499	1,209	2,300	2,408	3,426	1,282
SOCIOLOGY/ANTHROPOLOGY	546	180	366	418	128	257	289	374	172
SOCIAL SCIENCES, N.E.C.	13,383	5,934	7,448	12,247	1,135	4,800	8,583	9,871	3,512

SOURCE: NATIONAL SCIENCE FOUNDATION

Table B-11. Full-time science/engineering graduate students in doctorate-granting institutions by field, level of study, citizenship, sex, and type of control: 1985

FIELD	TOTAL	LEVEL OF STUDY		CITIZENSHIP		SEX		TYPE OF CONTROL	
		FIRST YEAR	BEYOND FIRST YEAR	U.S.	FOREIGN	MEN	WOMEN	PUBLIC	PRIVATE
TOTAL, ALL FIELDS	249,666	77,389	172,277	183,557	66,109	165,570	84,096	179,133	70,533
ENGINEERING	55,997	18,239	37,758	32,269	23,728	49,494	6,503	38,908	17,089
AEROSPACE	1,987	718	1,269	1,252	735	1,863	124	1,476	511
AGRICULTURAL	767	238	529	414	353	709	58	714	53
BIOMEDICAL	1,117	355	762	924	193	872	245	649	468
CHEMICAL	5,519	1,503	4,016	3,317	2,202	4,770	749	3,778	1,741
CIVIL	10,000	3,614	6,386	5,526	4,474	8,404	1,596	7,464	2,536
ELECTRICAL	14,423	4,747	9,676	7,978	6,445	13,262	1,161	9,484	4,939
ENGINEERING SCIENCE	1,305	347	958	828	477	1,180	125	659	646
INDUSTRIAL	4,248	1,524	2,724	2,525	1,723	3,395	853	2,934	1,314
MECHANICAL	8,566	2,884	5,682	4,699	3,867	8,017	549	6,166	2,400
METALLURGICAL/MATERIALS	3,064	782	2,282	1,789	1,275	2,632	432	1,903	1,161
MINING	371	105	266	237	134	345	26	311	60
NUCLEAR	1,030	274	756	600	430	939	91	820	210
PETROLEUM	551	121	430	311	240	508	43	404	147
ENGINEERING, N.E.C.	3,049	1,027	2,022	1,869	1,180	2,598	451	2,146	903
SCIENCES, TOTAL	193,669	59,150	134,519	151,288	42,381	116,076	77,593	140,225	53,444
PHYSICAL SCIENCES	26,065	6,390	19,675	17,772	8,293	20,839	5,226	18,515	7,550
ASTRONOMY	635	155	480	485	150	531	104	410	225
CHEMISTRY	15,186	3,714	11,472	11,195	3,991	11,360	3,826	11,044	4,142
PHYSICS	10,111	2,469	7,642	5,975	4,136	8,858	1,253	6,951	3,160
PHYSICAL SCIENCES, N.E.C.	133	52	81	117	16	90	43	110	23
ENVIRONMENTAL SCIENCES	10,918	3,073	7,845	9,277	1,641	8,187	2,731	8,917	2,001
ATMOSPHERIC SCIENCES	867	283	584	672	195	729	138	814	53
GEOSCIENCES	7,381	2,012	5,369	6,464	917	5,587	1,794	5,869	1,512
OCEANOGRAPHY	1,524	373	1,151	1,212	312	1,090	434	1,219	305
ENVIRONMENTAL SCIENCES, N.E.C.	1,146	405	741	929	217	781	365	1,015	131
MATHEMATICAL SCIENCES	11,180	3,713	7,467	6,520	4,660	8,204	2,976	8,322	2,858
COMPUTER SCIENCES	12,401	4,227	8,174	7,539	4,862	9,765	2,636	8,540	3,861
LIFE SCIENCES	66,235	20,404	45,831	55,222	11,013	34,453	31,782	51,156	15,079
AGRICULTURAL SCIENCES	8,723	2,316	6,407	6,461	2,262	6,467	2,256	8,435	288
BIOLOGICAL SCIENCES	36,165	9,325	26,840	29,908	6,257	21,429	14,736	26,462	9,703
ANATOMY	903	200	703	811	92	517	386	585	318
BIOCHEMISTRY	4,488	1,090	3,398	3,515	973	2,826	1,662	3,100	1,388
BIOLOGY	7,430	1,965	5,465	6,410	1,020	4,464	2,966	4,934	2,496
BIOMETRY/EPIDEMIOLOGY	996	367	629	823	173	458	538	527	469
BIOPHYSICS	407	72	335	312	95	306	101	230	177
BOTANY	2,840	670	2,170	2,213	627	1,794	1,046	2,639	201
CELL BIOLOGY	1,472	355	1,117	1,275	197	938	534	759	713
ECOLOGY	864	200	664	764	100	553	311	815	49
ENTOMOLOGY/PARASITOLOGY	1,155	249	906	919	236	868	287	1,104	51
GENETICS	1,014	247	767	851	163	565	449	752	262
MICROBIOLOGY	3,884	949	2,935	3,238	646	2,237	1,647	2,931	953
NUTRITION	2,946	922	2,024	2,046	900	1,083	1,863	2,311	635
PATHOLOGY	1,047	258	789	857	190	639	408	724	323
PHARMACOLOGY	1,996	497	1,499	1,746	250	1,238	758	1,345	651
PHYSIOLOGY	1,998	630	1,368	1,733	265	1,253	745	1,346	652
ZOOLOGY	1,759	401	1,358	1,574	185	1,137	622	1,657	102
BIOSCIENCES, N.E.C.	966	253	713	821	145	553	413	703	263
HEALTH SCIENCES	21,347	8,763	12,584	18,853	2,494	6,557	14,790	16,259	5,088
DENTISTRY	745	314	431	590	155	584	161	514	231
NEUROLOGY	322	86	236	288	34	199	123	202	120
NURSING	5,453	2,293	3,160	5,302	151	265	5,188	4,122	1,331
PHARMACEUTICAL SCIENCES	1,808	448	1,360	1,148	660	1,206	602	1,546	262
PREVENTIVE MEDICINE/ COMMUNITY HEALTH	3,876	1,992	1,884	3,119	757	1,633	2,243	2,650	1,226
SPEECH PATHOLOGY/AUDIOLOGY	4,583	1,930	2,653	4,377	206	676	3,907	3,837	746
VETERINARY SCIENCES	488	119	369	364	124	307	181	429	59
CLINICAL MEDICINE, N.E.C.	1,117	367	750	939	178	582	535	744	373
HEALTH RELATED, N.E.C.	2,955	1,214	1,741	2,726	229	1,105	1,850	2,215	740
PSYCHOLOGY	21,002	5,648	15,354	19,974	1,028	8,761	12,241	13,114	7,888
SOCIAL SCIENCES	45,868	15,695	30,173	34,984	10,884	25,867	20,001	31,661	14,207
AGRICULTURAL ECONOMICS	1,944	644	1,300	1,205	739	1,514	430	1,846	98
ANTHROPOLOGY	3,814	949	2,865	3,368	446	1,731	2,083	2,657	1,157
ECONOMICS (EXCEPT AGRICULTURAL)	8,612	2,567	6,045	4,853	3,759	6,604	2,008	5,599	3,013
GEOGRAPHY	2,000	649	1,351	1,639	361	1,361	639	1,807	193
HISTORY AND PHILOSOPHY OF SCIENCE	265	70	195	208	57	178	87	149	116
LINGUISTICS	2,321	712	1,609	1,409	912	985	1,336	1,486	835
POLITICAL SCIENCE	10,609	3,882	6,727	8,346	2,263	6,986	3,623	6,285	4,324
SOCIOLOGY	4,396	1,077	3,319	3,230	1,166	2,148	2,248	3,114	1,282
SOCIOLOGY/ANTHROPOLOGY	534	179	355	406	128	254	280	371	163
SOCIAL SCIENCES, N.E.C.	11,373	4,966	6,407	10,320	1,053	4,106	7,267	8,347	3,026

SOURCE: NATIONAL SCIENCE FOUNDATION

Table B-12. Foreign full-time science/engineering graduate students in doctorate-granting institutions by field: 1979-85

FIELD	NUMBER							AVERAGE ANNUAL PERCENT CHANGE		
	1979	1980	1981	1982	1983	1984	1985	1979-84	1984-85	1979-85
TOTAL, ALL FIELDS	44,750	48,671	52,598	55,302	59,898	61,095	66,109	6.4	8.2	6.7
ENGINEERING	16,211	17,503	19,201	20,812	22,406	22,737	23,728	7.0	4.4	6.6
AEROSPACE	520	565	598	575	747	736	735	7.2	-.1	5.9
AGRICULTURAL	274	293	298	341	341	327	353	3.6	8.0	4.3
BIOMEDICAL	131	135	157	199	195	220	193	10.9	-12.3	6.7
CHEMICAL	1,836	1,960	2,166	2,321	2,201	2,077	2,202	2.5	6.0	3.1
CIVIL	3,046	3,295	3,596	3,937	4,275	4,415	4,474	7.7	1.3	6.6
ELECTRICAL	3,758	4,163	4,614	5,009	5,663	5,782	6,445	9.0	11.5	9.4
ENGINEERING SCIENCE	305	361	368	436	493	484	477	9.7	-1.4	7.7
INDUSTRIAL	1,383	1,370	1,501	1,530	1,457	1,602	1,723	3.0	7.6	3.7
MECHANICAL	2,384	2,580	3,009	3,444	3,931	3,970	3,867	10.7	-2.6	8.4
METALLURGICAL/MATERIALS	1,018	1,100	1,106	1,173	1,166	1,204	1,275	3.4	5.9	3.8
MINING	112	136	150	117	153	141	134	4.7	-5.0	3.0
NUCLEAR	444	443	427	473	461	412	430	-1.5	4.4	-.5
PETROLEUM	231	201	192	256	286	284	240	4.2	-15.5	.6
ENGINEERING, N.E.C.	769	901	1,019	1,001	1,037	1,083	1,180	7.1	9.0	7.4
SCIENCES, TOTAL	28,539	31,168	33,397	34,490	37,492	38,358	42,381	6.1	10.5	6.8
PHYSICAL SCIENCES	5,176	5,586	6,077	6,292	7,041	7,367	8,293	7.3	12.6	8.2
ASTRONOMY	81	84	93	102	105	117	150	7.6	28.2	10.8
CHEMISTRY	2,745	2,868	3,064	3,080	3,400	3,503	3,991	5.0	13.9	6.4
PHYSICS	2,345	2,626	2,913	3,105	3,525	3,731	4,136	9.7	10.9	9.9
PHYSICAL SCIENCES, N.E.C.	5	8	7	5	11	16	16	26.2	.0	21.4
ENVIRONMENTAL SCIENCES	1,241	1,335	1,465	1,604	1,661	1,527	1,641	4.2	7.5	4.8
ATMOSPHERIC SCIENCES	149	144	179	186	180	161	195	1.6	21.1	4.6
GEOSCIENCES	734	810	877	903	908	858	917	3.2	6.9	3.8
OCEANOGRAPHY	185	208	245	338	376	297	312	9.9	5.1	9.1
ENVIRONMENTAL SCIENCES, N.E.C.	173	173	164	177	197	211	217	4.1	2.8	3.8
MATHEMATICAL SCIENCES	2,799	3,155	3,521	3,721	4,080	4,308	4,660	9.0	8.2	8.9
COMPUTER SCIENCES	1,541	1,870	2,205	2,771	3,512	3,999	4,862	21.0	21.6	21.1
LIFE SCIENCES	8,179	8,485	9,009	9,310	9,959	10,143	11,013	4.4	8.6	5.1
AGRICULTURAL SCIENCES	2,033	2,159	2,288	2,281	2,374	2,304	2,262	2.5	-1.8	1.8
BIOLOGICAL SCIENCES	4,193	4,346	4,637	4,871	5,333	5,632	6,257	6.1	11.1	6.9
ANATOMY	82	83	86	88	74	59	92	-6.4	55.9	1.9
BIOCHEMISTRY	436	497	589	654	767	843	973	14.1	15.4	14.3
BIOLOGY	667	720	733	742	869	1,002	1,020	8.5	1.8	7.3
BIOMETRY/EPIDEMIOLOGY	130	144	160	150	157	123	173	-1.1	40.7	4.9
BIOPHYSICS	72	56	61	70	80	80	95	2.1	18.8	4.7
BOTANY	515	519	535	589	602	612	627	3.5	2.5	3.3
CELL BIOLOGY	65	67	82	103	128	143	197	17.1	37.8	20.3
ECOLOGY	50	67	72	80	77	87	100	11.7	14.9	12.2
ENTOMOLOGY/PARASITOLOGY	225	227	263	227	240	224	236	-.1	5.4	.8
GENETICS	94	98	90	111	142	131	163	6.9	24.4	9.6
MICROBIOLOGY	385	406	410	431	504	533	646	6.7	21.2	9.0
NUTRITION	753	748	800	821	802	860	900	2.7	4.7	3.0
PATHOLOGY	149	162	184	172	206	168	190	2.4	13.1	4.1
PHARMACOLOGY	195	185	199	243	234	240	250	4.2	4.2	4.2
PHYSIOLOGY	178	171	180	188	212	255	265	7.5	3.9	6.9
ZOOLOGY	137	131	128	129	140	144	185	1.0	28.5	5.1
BIOSCIENCES, N.E.C.	60	65	65	73	99	128	145	16.4	13.3	15.8
HEALTH SCIENCES	1,953	1,980	2,084	2,158	2,252	2,207	2,494	2.5	13.0	4.2
DENTISTRY	211	223	173	129	122	130	155	-9.2	19.2	-5.0
NEUROLOGY	13	15	14	12	27	29	34	17.4	17.2	17.4
NURSING	182	173	220	197	149	160	151	-2.5	-5.6	-3.1
PHARMACEUTICAL SCIENCES	476	460	536	581	623	639	660	6.1	3.3	5.6
PREVENTIVE MEDICINE/COMMUNITY HEALTH	499	578	578	695	667	630	757	4.8	20.2	7.2
SPEECH PATHOLOGY/AUDIOLOGY	209	190	209	187	236	192	206	-1.7	7.3	-.2
VETERINARY SCIENCES	127	111	107	85	98	107	124	-3.4	15.9	-.4
CLINICAL MEDICINE, N.E.C.	105	106	113	136	150	106	178	.2	67.9	9.2
HEALTH RELATED, N.E.C.	131	124	134	136	180	214	229	10.3	7.0	9.8
PSYCHOLOGY	968	1,054	832	887	906	920	1,028	-1.0	11.7	1.0
SOCIAL SCIENCES	8,635	9,683	10,288	9,905	10,333	10,094	10,884	3.2	7.8	3.9
AGRICULTURAL ECONOMICS	657	737	757	690	725	726	739	2.0	1.8	2.0
ANTHROPOLOGY	321	389	422	379	396	378	446	3.3	18.0	5.6
ECONOMICS (EXCEPT AGRICULTURAL)	3,015	3,355	3,524	3,365	3,388	3,365	3,759	2.2	11.7	3.7
GEOGRAPHY	327	354	344	375	367	359	361	1.9	.6	1.7
HISTORY AND PHILOSOPHY OF SCIENCE	30	25	30	35	40	38	57	4.8	50.0	11.3
LINGUISTICS	612	740	752	709	837	829	912	6.3	10.0	6.9
POLITICAL SCIENCE	1,927	2,177	2,344	2,315	2,435	2,220	2,263	2.9	1.9	2.7
SOCIOLOGY	803	893	1,018	964	1,072	1,029	1,166	5.1	13.3	6.4
SOCIOLOGY/ANTHROPOLOGY	108	100	98	132	127	121	128	2.3	5.8	2.9
SOCIAL SCIENCES, N.E.C.	835	913	999	941	946	1,029	1,053	4.3	2.3	3.9

SOURCE: NATIONAL SCIENCE FOUNDATION

Table B-13. Full-time science/engineering graduate students with U.S. citizenship in doctorate-granting institutions by field: 1979-85

FIELD	NUMBER							AVERAGE ANNUAL PERCENT CHANGE		
	1979	1980	1981	1982	1983	1984	1985	1979-84	1984-85	1979-85
TOTAL, ALL FIELDS	178,659	181,864	181,596	181,637	183,695	185,761	183,557	.8	-1.2	.5
ENGINEERING	23,133	24,436	25,616	27,875	31,110	32,020	32,269	6.7	.8	5.7
AEROSPACE	631	759	882	944	1,078	1,104	1,252	11.8	13.4	12.1
AGRICULTURAL	371	338	374	398	425	446	414	3.8	-7.2	1.8
BIOMEDICAL	696	653	696	709	817	886	924	4.9	4.3	4.8
CHEMICAL	2,331	2,471	2,755	3,203	3,589	3,579	3,317	9.0	-7.3	6.1
CIVIL	4,696	4,815	5,212	5,490	5,682	5,867	5,526	4.6	-5.8	2.7
ELECTRICAL	5,093	5,530	5,542	6,268	7,191	7,679	7,978	8.6	3.9	7.8
ENGINEERING SCIENCE	748	770	836	816	846	772	828	.6	7.3	1.7
INDUSTRIAL	2,243	2,206	1,931	2,060	2,471	2,405	2,525	1.4	5.0	2.0
MECHANICAL	2,953	3,150	3,328	3,684	4,247	4,541	4,699	9.0	3.5	8.0
METALLURGICAL/MATERIALS	1,102	1,136	1,330	1,280	1,520	1,659	1,789	8.5	7.8	8.4
MINING	180	182	222	234	251	262	237	7.8	-9.5	4.7
NUCLEAR	631	600	605	569	591	606	600	-.8	-1.0	-.8
PETROLEUM	105	160	198	214	321	318	311	24.8	-2.2	19.8
ENGINEERING, N.E.C.	1,353	1,666	1,705	2,006	2,081	1,896	1,869	7.0	-1.4	5.5
SCIENCES, TOTAL	155,526	157,428	155,980	153,762	152,585	153,741	151,288	-.2	-1.6	-.5
PHYSICAL SCIENCES	16,621	16,668	16,523	17,038	17,451	17,782	17,772	1.4	-.1	1.1
ASTRONOMY	533	509	472	488	480	479	485	-2.1	1.3	-1.6
CHEMISTRY	10,097	10,208	10,098	10,664	11,083	11,112	11,195	1.9	.7	1.7
PHYSICS	5,944	5,893	5,901	5,838	5,838	6,071	5,975	.4	-1.6	.1
PHYSICAL SCIENCES, N.E.C.	47	58	52	48	50	120	117	20.6	-2.5	16.4
ENVIRONMENTAL SCIENCES	8,930	8,930	9,026	9,269	9,805	9,756	9,277	1.8	-4.9	.6
ATMOSPHERIC SCIENCES	590	602	560	585	598	609	672	.6	10.3	2.2
GEOSCIENCES	5,819	5,942	5,965	6,382	7,000	6,939	6,464	3.6	-6.8	1.8
OCEANOGRAPHY	1,303	1,322	1,344	1,213	1,171	1,221	1,212	-1.3	-.7	-1.2
ENVIRONMENTAL SCIENCES, N.E.C.	1,218	1,064	1,157	1,089	1,036	987	929	-4.1	-5.9	-4.4
MATHEMATICAL SCIENCES	6,337	6,213	6,159	6,453	6,232	6,305	6,520	-.1	3.4	.5
COMPUTER SCIENCES	3,532	4,030	4,260	5,137	5,755	6,109	7,539	11.6	23.4	13.5
LIFE SCIENCES	58,292	59,226	58,186	56,343	55,182	56,025	55,222	-.8	-1.4	-.9
AGRICULTURAL SCIENCES	7,338	7,432	7,342	7,219	7,023	7,023	6,461	-.9	-8.0	-2.1
BIOLOGICAL SCIENCES	31,644	31,471	30,817	30,355	29,854	30,321	29,908	-.9	-1.4	-.9
ANATOMY	959	907	877	849	847	889	811	-1.5	-8.8	-2.8
BIOCHEMISTRY	3,213	3,220	3,160	3,178	3,214	3,410	3,515	1.2	3.1	1.5
BIOLOGY	7,563	7,332	6,992	6,882	6,815	6,743	6,410	-2.3	-4.9	-2.7
BIOMETRY/EPIDEMIOLOGY	837	901	839	769	720	628	823	-5.6	31.1	-.3
BIOPHYSICS	426	420	396	353	357	339	312	-4.5	-8.0	-5.1
BOTANY	2,706	2,635	2,489	2,554	2,411	2,357	2,213	-2.7	-6.1	-3.3
CELL BIOLOGY	794	865	907	1,007	1,040	1,126	1,275	7.2	13.2	8.2
ECOLOGY	769	880	859	825	758	778	764	.2	-1.8	-.1
ENTOMOLOGY/PARASITOLOGY	1,238	1,298	1,189	1,113	1,065	1,040	919	-3.4	-11.6	-4.8
GENETICS	738	739	736	766	777	811	851	1.9	4.9	2.4
MICROBIOLOGY	3,101	3,153	3,052	3,068	3,172	3,283	3,238	1.1	-1.4	.7
NUTRITION	2,192	2,167	2,294	2,205	2,093	2,067	2,046	-1.2	-1.0	-1.1
PATHOLOGY	881	865	866	842	857	909	857	.6	-5.7	-.5
PHARMACOLOGY	1,656	1,699	1,714	1,696	1,697	1,685	1,746	.3	3.6	.9
PHYSIOLOGY	1,714	1,682	1,744	1,617	1,554	1,716	1,733	*	1.0	.2
ZOOLOGY	2,268	2,123	2,099	1,989	1,885	1,700	1,574	-5.6	-7.4	-5.9
BIOSCIENCES, N.E.C.	590	585	604	642	592	840	821	7.3	-2.3	5.7
HEALTH SCIENCES	19,310	20,323	20,027	18,769	18,305	18,681	18,853	-.7	.9	-.4
DENTISTRY	713	665	588	598	579	638	590	-2.2	-7.5	-3.1
NEUROLOGY	212	197	161	176	217	270	288	5.0	6.7	5.2
NURSING	5,959	6,067	6,515	5,985	5,568	5,522	5,302	-1.5	-4.0	-1.9
PHARMACEUTICAL SCIENCES	1,128	1,180	1,136	1,109	1,130	1,117	1,148	-.2	2.8	.3
PREVENTIVE MEDICINE/ COMMUNITY HEALTH	3,792	3,935	3,865	3,334	3,028	3,061	3,119	-4.2	1.9	-3.2
SPEECH PATHOLOGY/AUDIOLOGY	4,182	4,516	4,222	4,292	4,200	4,260	4,377	.4	2.7	.8
VETERINARY SCIENCES	296	271	243	271	239	295	364	-.1	23.4	3.5
CLINICAL MEDICINE, N.E.C.	837	861	814	853	845	874	939	.9	7.4	1.9
HEALTH RELATED, N.E.C.	2,191	2,631	2,483	2,151	2,499	2,644	2,726	3.8	3.1	3.7
PSYCHOLOGY	19,769	20,526	20,712	20,216	20,413	20,672	19,974	.9	-3.4	.2
SOCIAL SCIENCES	42,045	41,835	41,114	39,306	37,747	37,092	34,984	-2.5	-5.7	-3.0
AGRICULTURAL ECONOMICS	1,285	1,291	1,258	1,266	1,269	1,245	1,205	-.6	-3.2	-1.1
ANTHROPOLOGY	4,143	4,087	3,822	3,648	3,470	3,522	3,368	-3.2	-4.4	-3.4
ECONOMICS (EXCEPT AGRICULTURAL)	5,108	5,592	5,565	5,722	5,537	5,181	4,853	.3	-6.3	-.8
GEOGRAPHY	1,549	1,695	1,702	1,602	1,648	1,638	1,639	1.1	.1	.9
HISTORY AND PHILOSOPHY OF SCIENCE	204	216	187	188	189	205	208	.1	1.5	.3
LINGUISTICS	1,637	1,494	1,499	1,436	1,479	1,435	1,409	-2.6	-1.8	-2.5
POLITICAL SCIENCE	10,380	9,755	10,201	9,796	9,369	8,852	8,346	-3.1	-5.7	-3.6
SOCIOLOGY	4,339	4,398	4,077	3,679	3,508	3,432	3,230	-4.6	-5.9	-4.8
SOCIOLOGY/ANTHROPOLOGY	515	489	426	480	469	451	406	-2.6	-10.0	-3.9
SOCIAL SCIENCES, N.E.C.	12,885	12,818	12,377	11,489	10,809	11,131	10,320	-2.9	-7.3	-3.6

SOURCE: NATIONAL SCIENCE FOUNDATION

Table B-14. Full-time science/engineering graduate students in doctorate-granting institutions by field: 1979-85

FIELD	NUMBER							AVERAGE ANNUAL PERCENT CHANGE		
	1979	1980	1981	1982	1983	1984	1985	1979-84	1984-85	1979-85
TOTAL, ALL FIELDS	223,409	230,535	234,194	236,939	243,593	246,856	249,666	2.0	1.1	1.9
ENGINEERING	39,344	41,939	44,817	48,687	53,516	54,757	55,997	6.8	2.3	6.1
AEROSPACE	1,151	1,324	1,480	1,519	1,825	1,840	1,987	9.8	8.0	9.5
AGRICULTURAL	645	631	672	739	766	773	767	3.7	-.8	2.9
BIOMEDICAL	827	788	853	908	1,012	1,106	1,117	6.0	1.0	5.1
CHEMICAL	4,167	4,431	4,921	5,524	5,790	5,656	5,519	6.3	-2.4	4.8
CIVIL	7,742	8,110	8,808	9,427	9,957	10,282	10,000	5.8	-2.7	4.4
ELECTRICAL	8,851	9,693	10,156	11,277	12,854	13,461	14,423	8.7	7.1	8.5
ENGINEERING SCIENCE	1,053	1,131	1,204	1,252	1,339	1,256	1,305	3.6	3.9	3.6
INDUSTRIAL	3,626	3,576	3,432	3,590	3,928	4,007	4,248	2.0	6.0	2.7
MECHANICAL	5,337	5,730	6,337	7,128	8,178	8,511	8,566	9.8	.6	8.2
METALLURGICAL/MATERIALS	2,120	2,236	2,436	2,453	2,686	2,863	3,064	6.2	7.0	6.3
MINING	292	318	372	351	404	403	371	6.7	-7.9	4.1
NUCLEAR	1,075	1,043	1,032	1,042	1,052	1,018	1,030	-1.1	1.2	-.7
PETROLEUM	336	361	390	470	607	602	551	12.4	-8.5	8.6
ENGINEERING, N.E.C.	2,122	2,567	2,724	3,007	3,118	2,979	3,049	7.0	2.3	6.2
PHYSICAL SCIENCES	21,797	22,254	22,600	23,330	24,492	25,149	26,065	2.9	3.6	3.0
ASTRONOMY	614	593	565	590	585	596	635	-.6	6.5	.6
CHEMISTRY	12,842	13,076	13,162	13,744	14,483	14,615	15,186	2.6	3.9	2.8
PHYSICS	8,289	8,519	8,814	8,943	9,363	9,802	10,111	3.4	3.2	3.4
PHYSICAL SCIENCES, N.E.C.	52	66	59	53	61	136	133	21.2	-2.2	16.9
ENVIRONMENTAL SCIENCES	10,171	10,265	10,491	10,873	11,466	11,283	10,918	2.1	-3.2	1.2
ATMOSPHERIC SCIENCES	739	746	739	771	778	770	867	.8	12.6	2.7
GEOSCIENCES	6,553	6,752	6,842	7,285	7,908	7,797	7,381	3.5	-5.3	2.0
OCEANOGRAPHY	1,488	1,530	1,589	1,551	1,547	1,518	1,524	.4	.4	.4
ENVIRONMENTAL SCIENCES, N.E.C.	1,391	1,237	1,321	1,266	1,233	1,198	1,146	-2.9	-4.3	-3.2
MATHEMATICAL SCIENCES	9,136	9,368	9,680	10,174	10,312	10,613	11,180	3.0	5.3	3.4
COMPUTER SCIENCES	5,073	5,900	6,465	7,908	9,267	10,108	12,401	14.8	22.7	16.1
LIFE SCIENCES	66,471	67,711	67,195	65,653	65,141	66,168	66,235	-.1	.1	-.1
AGRICULTURAL SCIENCES	9,371	9,591	9,630	9,500	9,397	9,327	8,723	-.1	-6.5	-1.2
BIOLOGICAL SCIENCES	35,837	35,817	35.454	35,226	35,187	35,953	36,165	.1	.6	.2
ANATOMY	1,041	990	963	937	921	948	903	-1.9	-4.7	-2.3
BIOCHEMISTRY	3,649	3,717	3,749	3,832	3,981	4,253	4,488	3.1	5.5	3.5
BIOLOGY	8,230	8,052	7,725	7,624	7,684	7,745	7,430	-1.2	-4.1	-1.7
BIOMETRY/EPIDEMIOLOGY	967	1,045	999	919	877	751	996	-4.9	32.6	.5
BIOPHYSICS	498	476	457	423	437	419	407	-3.4	-2.9	-3.3
BOTANY	3,220	3,154	3.024	3,143	3,013	2,969	2,840	-1.6	-4.3	-2.1
CELL BIOLOGY	859	932	989	1,110	1,168	1,269	1,472	8.1	16.0	9.4
ECOLOGY	819	947	931	905	835	865	864	1.1	-.1	.9
ENTOMOLOGY/PARASITOLOGY	1,463	1,525	1,452	1,340	1,305	1,264	1,155	-2.9	-8.6	-3.9
GENETICS	832	837	826	877	919	942	1,014	2.5	7.6	3.4
MICROBIOLOGY	3,486	3,559	3,462	3,499	3,676	3,816	3,884	1.8	1.8	1.8
NUTRITION	2,945	2,915	3,094	3,026	2,895	2,927	2,946	-.1	.6	*
PATHOLOGY	1,030	1,027	1,050	1,014	1,063	1,077	1,047	.9	-2.8	.3
PHARMACOLOGY	1,851	1,884	1,913	1,939	1,931	1,925	1,996	.8	3.7	1.3
PHYSIOLOGY	1,892	1,853	1,924	1,805	1,766	1,971	1,998	.8	1.4	.9
ZOOLOGY	2,405	2,254	2,227	2,118	2,025	1,844	1,759	-5.2	-4.6	-5.1
BIOSCIENCES, N.E.C.	650	650	669	715	691	968	966	8.3	-.2	6.8
HEALTH SCIENCES	21,263	22,303	22,111	20,927	20,557	20,888	21,347	-.4	2.2	.1
ANESTHESIOLOGY	18	13	16	19	27	58	65	26.4	12.1	23.9
CANCER/ONCOLOGY	61	54	53	69	73	82	64	6.1	-22.0	.8
CARDIOLOGY	3	17	3	3	3	3	10	.0	233.3	22.2
DENTISTRY	924	888	761	727	701	768	745	-3.6	-3.0	-3.5
ENDOCRINOLOGY	43	48	46	50	64	37	50	-3.0	35.1	2.5
GASTROENTEROLOGY	0	0	3	1	0	1	1	**	.0	**
HEMATOLOGY	14	8	9	6	9	8	7	-10.6	-12.5	-10.9
NEUROLOGY	225	212	175	188	244	299	322	5.9	7.7	6.2
NURSING	6,141	6,240	6,735	6,182	5,717	5,682	5,453	-1.5	-4.0	-2.0
OBSTETRICS/GYNECOLOGY	33	5	10	15	15	15	9	-14.6	-40.0	-19.5
OPHTHALMOLOGY	5	15	19	8	7	11	10	17.1	-9.1	12.2
OTORHINOLARYNGOLOGY	13	14	11	11	5	2	10	-31.2	400.0	-4.3
PEDIATRICS	119	127	145	144	138	142	161	3.6	13.4	5.2
PHARMACEUTICAL SCIENCES	1,604	1,640	1,672	1,690	1,753	1,756	1,808	1.8	3.0	2.0
PREVENTIVE MEDICINE COMMUNITY HEALTH	4,291	4,513	4,443	4,029	3,695	3,691	3,876	-3.0	5.0	-1.7
PSYCHIATRY	120	61	57	68	80	68	56	-10.7	-17.6	-11.9
PULMONARY DISEASE	1	15	9	10	2	2	5	14.9	150.0	30.8
RADIOLOGY	220	233	237	208	169	182	169	-3.7	-7.1	-4.3
SPEECH PATHOLOGY/AUDIOLOGY	4,391	4,706	4,431	4,479	4,436	4,452	4,583	.3	2.9	.7
SURGERY	66	85	83	87	73	58	64	-2.6	10.3	-.5
VETERINARY SCIENCES	423	382	350	356	337	402	488	-1.0	21.4	2.4
CLINICAL MEDICINE, N.E.C.	226	272	226	290	330	311	436	6.6	40.2	11.6
HEALTH RELATED, N.E.C.	2,322	2,755	2,617	2,287	2,679	2,858	2,955	4.2	3.4	4.1
PSYCHOLOGY	20,737	21,580	21,544	21,103	21,319	21,592	21,002	.8	-2.7	.2
SOCIAL SCIENCES	50,680	51,518	51,402	49,211	48,080	47,186	45,868	-1.4	-2.8	-1.6
AGRICULTURAL ECONOMICS	1,942	2,028	2,015	1,956	1,994	1,971	1,944	.3	-1.4	*
ANTHROPOLOGY	4,464	4,476	4,244	4,027	3,866	3,900	3,814	-2.7	-2.2	-2.6
ECONOMICS (EXCEPT AGRICULTURAL)	8,123	8,947	9,089	9,087	8,925	8,546	8,612	1.0	.8	1.0
GEOGRAPHY	1,876	2,049	2,046	1,977	2,015	1,997	2,000	1.3	.2	1.1
HISTORY AND PHILOSOPHY OF SCIENCE	234	241	217	223	229	243	265	.8	9.1	2.1
LINGUISTICS	2,249	2,234	2,251	2,145	2,316	2.264	2,321	.1	2.5	.5
POLITICAL SCIENCE	12,307	11,932	12,545	12,111	11,804	11,072	10,609	-2.1	-4.2	-2.4
SOCIOLOGY	5,142	5,291	5,095	4,643	4,580	4,461	4,396	-2.8	-1.5	-2.6
SOCIOLOGY/ANTHROPOLOGY	623	589	524	612	596	572	534	-1.7	-6.6	-2.5
SOCIAL SCIENCES, N.E.C.	13,720	13,731	13,376	12,430	11,755	12,160	11,373	-2.4	-6.5	-3.1

SOURCE: NATIONAL SCIENCE FOUNDATION

Table B-15. GRE general test score data by current educational status, degree goal, intended graduate field, location of undergraduate school, and residency status, for U.S. citizens and non-U.S. citizens: 1981-82

Subgrouping variable	U.S. citizens							Non-U.S. citizens						
		GRE verbal		GRE quantitative		GRE analytical			GRE verbal		GRE quantitative		GRE analytical	
	Number	Mean	S.D.	Mean	S.D.	Mean	S.D.	Number	Mean	S.D.	Mean	S.D.	Mean	S.D.
Educational status														
Total	15,484	498	115	522	132	521	124	24,767	376	119	588	137	443	116
Enrolled undergraduate	6,966	497	112	543	132	542	124	7,169	394	127	598	137	474	121
Non-enrolled B.A./B.S.	4,166	514	113	527	124	526	117	5,600	370	118	602	130	443	110
Enrolled graduate	2,366	462	115	471	130	473	119	4,598	360	114	569	144	424	115
Non-enrolled M.A./M.S.	1,200	515	121	496	128	493	119	3,863	358	108	566	141	413	106
Other status	786	508	120	499	133	492	120	3,537	385	118	595	129	440	113
Degree goal														
Total	15,113	498	114	521	132	520	123	24,948	377	119	588	137	444	116
Ph.D.	5,666	530	113	549	128	543	124	11,146	399	124	609	133	460	118
M.A./M.S.	9,447	479	111	504	131	507	121	13,002	359	112	571	137	430	112
Intended graduate field														
Total	13,161	498	115	522	132	521	124	22,770	377	119	590	136	444	116
Arts and humanities	1,781	527	119	509	124	528	122	1,745	404	137	520	135	440	116
Social sciences	6,497	485	117	483	124	496	120	6,061	391	124	517	142	428	117
Biosciences	2,876	498	105	533	116	530	118	3,222	382	116	543	131	428	118
Mathematics/physical sciences	2,007	520	109	645	104	582	120	11,742	364	113	652	102	458	112
Undergraduate school														
Total	15,638	498	115	521	132	520	124	26,405	375	119	589	137	443	116
U.S. institution	14,951	500	114	523	131	523	123	7,271	363	110	532	140	423	114
Non-U.S. institution	687	462	121	474	136	470	121	19,134	380	122	611	129	451	115
Residency status														
Total	0	NA	NA	NA	NA	NA	NA	26,455	375	119	509	136	443	116
Resident alien	0	NA	NA	NA	NA	NA	NA	5,131	370	117	530	142	420	115
Other non-U.S.	0	NA	NA	NA	NA	NA	NA	21,324	376	120	603	131	449	115

NOTE: Underscoring indicates a subgroup value higher than that for the total group. NA – not applicable.

SOURCE: *A Comparative Analysis of Selected Background Data and Test Performance for U.S. and Foreign Examinees Taking the GRE General (Aptitude) Test During 1981/82*, Educational Testing Service, Graduate Records Examinations Board, November 1983

Table B-16. Comparison by senior academic officials of quality of applicants for graduate science/engineering study holding foreign baccalaureates with holders of U.S. baccalaureates by control and types of institution: 1982

(In percentages)

Comparison	All institutions					Public institutions			Private institutions		
		Doctorate-granting									
	Total	All	Top 50	All other	Nondoctorate-granting	Total	Doctorate-granting	Nondoctorate-granting	Total	Doctorate-granting	Nondoctorate-granting
Institutions with foreign applicants (N)	393	222	50	172	171	260	135	125	133	87	46
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Both groups have approximately equal qualifications	46.9	46.1	46.3	46.0	47.9	42.1	43.3	40.7	55.8	50.4	66.0
Foreign applicants have significantly better qualifications	9.8	13.9	10.4	14.9	4.3	9.0	11.6	6.0	11.3	17.4	0.0
Applicants from U.S. institutions have significantly better qualifications	43.3	40.0	43.3	39.1	47.8	48.9	45.0	53.3	32.9	32.3	34.0

SOURCE: "Student Quality in the Sciences and Engineering: Opinions of Senior Academic Officials," American Council on Education, *Higher Education Panel Report No. 58*, February 1984

Table B-17. Doctorate-granting institutions ranked by foreign science/engineering (S/E) graduate enrollment: 1985

Rank	Institution	Total graduate S/E enrollment	Foreign graduate S/E enrollment	Foreign as a percent of total	Foreign post-doctorates	S/E Ph.D.'s awarded to non-U.S. citizens
	Total, all institutions	371,052	76,020	20.5	8,959	4,847
1	Univ of So Calif	8,373	1,464	17.5	182	48
2	Univ of Calif Berkeley	5,448	1,454	26.7	218	109
3	Univ of Wis Madison	5,229	1,441	27.6	126	115
4	Univ of Mich	4,655	1,400	30.1	99	91
5	Mass Inst of Tech	4,552	1,380	30.3	188	125
6	Ohio State Univ	4,944	1,280	25.9	111	100
7	Univ of Ill Urbana	4,673	1,249	26.7	120	124
8	Univ of Tex Austin	4,931	1,243	25.2	114	83
9	Univ of Minn	5,760	1,190	20.7	90	81
10	Iowa State U of S&T	2,578	1,106	42.9	41	81
	Total, 1st 10 institutions	51,143	13,207	25.8	1,289	957
11	Cornell Univ	3,313	1,020	30.8	134	100
12	Stanford Univ	4,135	988	23.9	198	97
13	Mich State Univ	3,070	982	32.0	97	60
14	Penna State Univ	3,781	977	25.8	68	64
15	Purdue Univ	3,654	971	26.6	120	100
16	Univ of Calif Los Angeles	4,214	956	22.7	192	3
17	Univ of Ariz	3,601	908	25.2	93	27
18	Univ of Md Coll Pk	3,439	892	25.9	0	45
19	Univ of Pittsburgh	4,314	870	20.2	79	55
20	Columbia U Main Div	3,065	865	28.2	104	64
	Total, 1st 20 institutions	87,729	22,636	25.8	2,374	1,572
21	Univ of Wash	4,234	815	19.2	120	42
22	Univ of Fla	3,244	801	24.7	144	86
23	Va Poly Inst	3,527	781	22.1	34	59
24	SUNY - Buffalo	2,988	758	25.4	134	61
25	Univ of Houston Univ Pk	1,632	728	44.6	46	28
26	Rutgers the State Univ	4,321	726	16.8	52	47
27	Ore State Univ	1,673	715	42.7	31	53
28	LSU System	2,060	682	33.1	63	24
29	N Car State U Raleigh	2,690	674	25.1	38	60
30	SUNY - Stony Brook	2,270	656	28.9	98	54
	Total, 1st 30 institutions	116,368	29,972	25.8	3,134	2,086
31	Univ of Iowa	2,245	643	28.6	45	34
32	Univ of Penna	2,523	642	25.4	115	59
33	Texas A&M Univ	3,795	617	16.3	93	58
34	Univ of Calif Davis	2,662	605	22.7	79	56
35	Univ of Ill Chicago	2,681	589	22.0	61	30
36	Univ of Mass Amherst	2,506	581	23.2	6	36
37	N Y U	3,082	580	18.8	76	26
38	Rensselaer Poly Inst	1,761	550	31.2	35	53
39	Univ of Okla	2,358	550	23.3	48	23
40	Ill Inst of Tech	1,781	546	30.7	14	23
	Total, 1st 40 institutions	141,762	35,875	25.3	3,706	2,484

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Table B-17. Doctorate-granting institutions ranked by foreign science/engineering (S/E) graduate enrollment: 1985—Con.

Rank	Institution	Total graduate S/E enrollment	Foreign graduate S/E enrollment	Foreign as a percent of total	Foreign post-doctorates	S/E Ph.D.'s awarded to non-U.S. citizens
41	Geo Wash Univ	3,532	546	15.5	9	26
42	Univ of Hawa Manoa	1,897	540	28.5	14	55
43	Harvard Univ	2,569	538	20.9	556	43
44	Syracuse Univ	2,279	535	23.5	46	23
45	Univ of Kans	2,493	530	21.3	65	35
46	Univ of Cincinnati	2,483	513	20.7	35	23
47	Northwestern Univ	1,759	512	29.1	125	74
48	Ariz State Univ	2,662	505	19.0	31	8
49	Case Western Res Univ	1,921	503	26.2	71	43
50	Univ of Mo Columbia	1,987	503	25.3	27	39
	Total, 1st 50 institutions	165,344	41,100	24.9	4,685	2,853
51	Univ of Tex Arlington	2,117	502	23.7	13	7
52	So Ill Univ Carbondale	1,505	499	33.2	18	13
53	Okla State Univ	1,439	498	34.6	8	47
54	Santa Clara Univ	1,580	493	31.2	0	2
55	N J Inst of Tech	2,110	491	23.3	0	3
56	Indiana Univ	1,869	478	25.6	86	37
57	Univ of Georgia	1,667	447	26.8	51	34
58	Ga. Inst of Tech	2,271	447	19.7	22	29
59	Wayne State Univ	2,233	441	19.7	17	25
60	Kans State U Ag&AS	1,345	432	32.1	19	43
	Total, 1st 60 institutions	183,480	45,828	25.0	4,919	3,093
61	Ohio Univ	897	431	48.0	0	6
62	Princeton Univ	1,164	429	36.9	64	45
63	Howard Univ	947	412	43.5	13	24
64	Colo State Univ	1,768	405	22.9	42	47
65	N Y Inst of Tech	1,077	404	37.5	0	0
66	Texas Tech Univ	1,143	398	34.8	25	15
67	Univ of Ky	1,872	394	21.0	78	16
68	W Va Univ	1,652	393	23.8	25	26
69	Univ of Colo	3,121	388	12.4	68	25
70	Boston Univ	2,712	386	14.2	10	36
	Total, 1st 70 institutions	199,833	49,868	25.0	5,244	3,333
71	CUNY Grad Sch & Univ Ctr	1,731	385	22.2	12	36
72	Yale Univ	1,824	384	21.1	172	44
73	Utah State Univ	1,078	383	35.5	15	26
74	N Texas State Univ	1,295	372	28.7	24	13
75	Calif Inst of Tech	998	364	36.5	69	41
76	Univ of Chicago	1,503	362	24.1	103	16
77	Univ of Utah	2,167	353	16.3	88	25
78	Univ of Conn	2,348	350	14.9	48	21
79	Univ of Calif San Diego	1,404	349	24.9	144	26
80	American Univ	1,720	348	20.2	1	10
	Total, 1st 80 institutions	215,901	53,518	24.8	5,920	3,591

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Table B-17. Doctorate-granting institutions ranked by foreign science/engineering (S/E) graduate enrollment: 1985—Con.

Rank	Institution	Total graduate S/E enrollment	Foreign graduate S/E enrollment	Foreign as a percent of total	Foreign post-doctorates	S/E Ph.D.'s awarded to non-U.S. citizens
81	Univ of Calif Sta Barbara	1,347	344	25.5	46	31
82	Univ of Miami	1,215	342	28.1	14	11
83	Univ of Mo Rolla	1,316	336	25.5	6	15
84	Johns Hopkins Univ	1,517	334	22.0	190	24
85	Univ of Rochester	1,224	329	26.9	82	24
86	Clemson Univ	1,224	325	26.6	5	5
87	Washington U St Louis	1,332	321	24.1	80	25
88	Fla Inst of Tech	3,255	320	9.8	1	0
89	Carnegie-Mellon Univ	1,419	317	22.3	50	50
90	Drexel Univ	1,336	317	23.7	35	14
	Total, 1st 90 institutions	231,086	56,803	24.6	6,429	3,790
91	Univ of SW La	693	315	45.5	1	3
92	Univ of Neb Lincoln	1,384	310	22.4	25	35
93	Auburn Univ	1,227	301	24.5	12	16
94	Stevens Inst of Tech	1,766	301	17.0	13	9
95	Miss State Univ	949	289	30.5	4	20
96	Wash State Univ	1,440	289	20.1	31	33
97	Univ of Lowell	1,805	285	15.8	7	3
98	Western Mich Univ	1,468	285	19.4	4	0
99	Univ of Wis Milwaukee	1,894	283	14.9	17	20
100	Lehigh Univ	964	276	28.6	21	21
	Total, 1st 100 institutions	244,676	59,737	24.4	6,564	3,950
	All other institutions	126,376	16,283	12.9	2,395	897

SOURCE: National Science Foundation

Table B-18. Master's-granting institutions ranked by foreign science/engineering (S/E) graduate enrollment: 1983

Rank	Institution	Total graduate S/E enrollment	Foreign graduate S/E enrollment	Foreign as a percent of total	Foreign postdoctorates
	Total, all institutions	55,288	4,785	8.7	12
1	Calif State U Fullerton	1,353	315	23.3	0
2	Calif State U Northridge	1,160	233	20.1	0
3	San Jose State Univ	1,742	193	11.1	0
4	Calif State U Long Beach	1,751	190	10.9	0
5	San Francisco State Univ	858	112	13.1	1
6	Mankato State Univ	294	109	37.1	0
7	N Car A&T State Univ	232	106	45.7	1
8	Roosevelt Univ	566	102	18.0	0
9	Manhattan College	354	102	28.8	0
10	Calif State U Los Angeles	1,149	96	8.4	0
	Total, 1st 10 institutions	9.459	1,558	16.5	2
11	Univ of San Francisco	448	93	20.8	0
12	E Mich Univ	570	88	15.4	0
13	Loyola Marymount Univ	335	87	26.0	0
14	Calif State U Fresno	643	87	13.5	0
15	CUNY Bernard Baruch Coll	788	86	10.9	0
16	Ala A&M Univ	251	78	31.1	1
17	Univ of Bridgeport	547	75	13.7	0
18	CUNY Queens Coll	383	72	18.8	4
19	Texas A&I Univ	197	71	36.0	0
20	Tuskegee Institute	118	69	58.5	0
	Total, 1st 20 institutions	13,739	2,364	17.2	7
21	Montclair State Coll	604	62	10.3	0
22	Western Ill Univ	320	62	19.4	0
23	Sangamon State Univ	709	58	8.2	0
24	So Ill U Edwardsville	365	57	15.6	0
25	Univ of Wis Stout	347	52	15.0	0
26	SW Texas State Univ	532	51	9.6	0
27	Jackson State Univ	253	50	19.8	0
28	Tenn State Univ	388	49	12.6	0
29	Calif State U Chico	288	44	15.3	0
30	Univ of New Haven	602	44	7.3	0
	Total, 1st 30 institutions	18,147	2,893	15.9	7
31	West Coast Univ	306	40	13.1	0
32	Youngstown State Univ	158	40	25.3	0
33	Hartford Grad Univ	1,017	40	3.9	0
34	Prairie View A&M Univ	116	39	33.6	0
35	Rochester Inst of Tech	869	38	4.4	0
36	Bradley Univ	154	38	24.7	0
37	Middle Tenn State Univ	256	37	14.5	0
38	Cal Poly St U San Luis Ob	250	37	14.8	0
39	Seattle Univ	349	36	10.3	0
40	Univ of D C	130	36	27.7	0
	Total, 1st 40 institutions	21,752	3,274	15.1	7
41	Antioch Univ	965	32	3.3	0
42	St Mary's U San Antonio	240	31	12.9	0
43	Univ of Nev Las Vegas	190	29	15.3	0
44	Univ of La Verne	248	28	11.3	0
45	West Chester U of Penna	306	27	8.8	0
46	Eastern Wash Univ	348	27	7.8	1
47	Pittsburg State Univ	215	25	11.6	0
48	Biscayne College	245	25	10.2	0
49	Western Wash Univ	214	24	11.2	0
50	Northrop Univ	76	24	31.6	0
	Total, 1st 50 institutions	24,799	3,546	14.3	8

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Table B-18. Master's-granting institutions ranked by foreign science/engineering (S/E) graduate enrollment: 1983—Con.

Rank	Institution	Total graduate S/E enrollment	Foreign graduate S/E enrollment	Foreign as a percent of total	Foreign postdoctorates
51	Texas Southern Univ	174	24	13.8	0
52	John F Kennedy Univ	796	24	3.0	0
53	CUNY John Jay Coll Crim J	450	23	5.1	0
54	Southeastern Mass Univ	110	23	20.9	0
55	Ark State Univ	240	22	9.2	0
56	Univ of Scranton	173	22	12.7	0
57	Univ Alas Anchorage	168	20	11.9	0
58	Pepperdine Univ	375	20	5.3	0
59	Univ of Houston Clr Lk C	943	19	2.0	0
60	Univ of Hartford	230	19	8.3	0
	Total, 1st 60 institutions	28,458	3,762	13.2	8
61	Marywood Coll	500	19	3.8	0
62	Williams Coll	19	19	100.0	0
63	Tarleton State Univ	54	18	33.3	0
64	Southern U A&M Coll	70	18	25.7	0
65	Calif State U Sacramento	1,191	18	1.5	0
66	Morgan State Univ	62	18	29.0	0
67	National Univ	335	18	5.4	0
68	Monterey Inst Integ Stud	81	17	21.0	0
69	Western Ky Univ	218	17	7.8	0
70	Eastern Ill Univ	146	17	11.6	0
	Total, 1st 70 institutions	31,134	3,941	12.7	8
71	Trinity Univ	305	17	5.6	2
72	Goddard Coll	38	16	42.1	0
73	Indiana Univ of Penna	163	16	9.8	0
74	Univ of Ark Little Rock	268	16	6.0	0
75	Eastern N Mex Univ	145	15	10.3	0
76	Fla A&M Univ	58	15	25.9	0
77	Chapman Coll	175	15	8.6	0
78	Monmouth Coll N J	133	15	11.3	0
79	Loyola Coll	676	15	2.2	0
80	NE Mo State Univ	107	14	13.1	0
	Total, 1st 80 institutions	33,202	4,095	12.3	10
81	Pratt Institute	74	14	18.9	0
82	Midwestern State Univ	143	14	9.8	0
83	Univ of Mass Boston	108	14	13.0	0
84	Wagner Coll	142	13	9.2	0
85	Univ of Baltimore	238	13	5.5	0
86	Univ of W Fla	322	13	4.0	0
87	Widener Univ	105	13	12.4	0
88	N Car Ctrl Univ	74	12	16.2	0
89	Worcester State Coll	138	12	8.7	0
90	NW Mo State Univ	94	12	12.8	0
	Total, 1st 90 institutions	34,640	4,225	12.2	10
91	N Mex Highlands Univ	73	11	15.1	0
92	Pacific States Univ	28	11	39.3	0
93	U of Tex Permian Basin	137	11	8.0	0
94	Pacific Lutheran Univ	140	11	7.9	0
95	Univ of Tenn Chattanooga	171	11	6.4	0
96	Russell Sage Coll	610	10	1.6	0
97	Emporia State U Kans	231	10	4.3	0
98	Eastern Ky Univ	157	10	6.4	0
99	Mont Coll Min Sc & Tech	75	10	13.3	0
100	Univ of Portland	103	10	9.7	0
	Total, 1st 100 institutions	36,365	4,330	11.9	10
	All other institutions	18,923	455	2.4	2

NOTE: Data on master's degree-granting institutions were obtained through a sample survey after 1983. Hence data on students from these institutions cannot be provided for later years.

SOURCE: National Science Foundation

Table B-19. Distribution of foreign full-time graduate enrollment by broad science/engineering field for departments ranked by quality: 1974-77 and 1979-83

Field/quality of department	1974	1975	1976	1977	1979	1980	1981	1982	1983
	Percentage distribution								
Full-time enrollment, foreign	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Highest	20.8	20.7	20.9	20.0	18.2	16.8	17.2	16.2	16.3
2nd highest	19.1	19.0	18.3	18.4	18.1	18.2	18.3	18.7	18.7
3rd highest	21.0	21.0	21.0	20.8	21.5	22.8	22.7	22.7	22.6
Lowest rated	28.0	26.9	27.1	27.5	27.5	27.3	27.1	26.1	26.0
Nonrated	11.0	12.4	12.7	13.3	14.7	14.9	14.7	16.4	16.4
Engineering, foreign	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Highest	26.3	26.4	27.9	25.9	23.6	21.6	21.6	19.5	20.3
2nd highest	16.9	16.4	16.3	17.8	16.7	17.6	17.3	17.9	17.1
3rd highest	17.9	17.5	18.7	18.3	19.2	22.1	21.2	21.0	21.1
Lowest rated	27.5	25.4	24.1	24.6	26.0	24.5	25.6	24.2	25.2
Nonrated	11.4	14.3	12.9	13.4	14.4	14.3	14.4	17.4	16.4
Mathematics, computer sciences, foreign	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Highest	17.1	17.1	16.6	17.0	13.7	12.2	12.7	12.1	11.4
2nd highest	23.8	27.0	25.5	25.7	24.8	22.0	20.4	19.8	19.9
3rd highest	22.2	21.2	20.4	19.3	18.5	19.9	18.9	18.1	18.1
Lowest rated	26.4	23.0	24.7	24.1	28.3	29.7	28.8	27.9	25.1
Nonrated	10.6	11.8	12.8	13.9	14.6	16.1	19.2	22.2	25.5
Physical, environmental sciences, foreign	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Highest	16.0	16.7	16.2	15.7	15.3	14.2	14.4	14.8	15.0
2nd highest	22.8	22.4	21.6	21.4	20.5	21.3	21.9	22.0	22.5
3rd highest	21.0	20.1	20.3	20.1	21.9	22.7	22.8	23.3	23.1
Lowest rated	27.7	29.1	29.3	30.1	29.9	29.7	29.3	28.7	27.7
Nonrated	12.6	11.7	12.7	12.6	12.4	12.1	11.7	11.2	11.7
Biological sciences, foreign	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Highest	15.3	14.0	14.3	13.7	14.0	13.8	14.0	12.6	11.5
2nd highest	19.0	21.0	19.2	18.1	20.1	19.9	21.0	20.8	21.4
3rd highest	23.4	22.9	21.0	20.1	21.0	21.0	20.3	21.8	21.6
Lowest rated	30.5	30.4	34.0	35.3	32.4	32.0	31.0	29.6	30.5
Nonrated	11.9	11.7	11.5	12.8	12.5	13.3	13.7	15.3	15.0
Psychology, social sciences, foreign	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Highest	21.3	19.6	18.8	18.3	15.8	15.1	16.1	15.3	15.2
2nd highest	16.2	15.1	13.7	12.8	14.2	14.2	15.1	15.8	16.5
3rd highest	24.5	26.4	25.5	26.2	26.4	25.9	27.9	28.8	29.0
Lowest rated	29.2	28.3	29.1	29.4	26.2	27.3	25.9	24.7	25.2
Nonrated	8.7	10.6	12.9	13.3	17.5	17.5	15.0	15.4	14.0

SOURCES: Council of Graduate Schools, National Research Council, and the National Science Foundation

Table B-20. Foreign as a percent of full-time graduate enrollment by broad science/engineering field for departments ranked by quality: 1974-77 and 1979-83

Field/quality of department	1974	1975	1976	1977	1979	1980	1981	1982	1983
Full-time enrollment, foreign	17.3	17.2	17.7	18.8	22.8	24.2	25.8	26.4	27.6
Highest	20.3	20.6	21.6	22.2	23.5	23.0	25.6	24.8	26.5
2nd highest	16.7	16.9	16.9	18.0	21.3	22.7	24.4	25.7	27.4
3rd highest	16.0	15.5	16.3	17.5	22.0	25.1	26.4	27.1	28.4
Lowest rated	17.0	16.6	17.0	18.5	23.4	24.6	26.5	26.8	27.9
Nonrated	16.9	17.4	17.8	18.6	24.5	25.4	25.7	27.6	27.7
Engineering, foreign	33.8	33.5	35.4	37.2	43.2	43.7	45.5	45.1	44.6
Highest	32.6	32.4	35.2	36.0	36.2	34.7	37.0	35.8	37.2
2nd highest	34.2	34.9	35.1	26.4	40.7	43.9	43.9	45.6	44.5
3rd highest	33.9	32.3	36.7	38.0	46.8	52.0	50.3	48.5	47.5
Lowest rated	37.0	35.8	34.9	37.2	48.5	46.0	50.9	49.6	50.6
Nonrated	29.1	32.2	35.6	39.7	47.0	46.5	48.0	48.4	43.8
Mathematics, computer sciences, foreign	19.7	20.8	22.7	24.8	31.0	33.2	36.1	36.8	38.6
Highest	23.4	25.6	26.1	28.5	28.4	28.8	34.4	35.0	37.1
2nd highest	19.4	23.7	25.2	27.4	33.6	34.3	34.2	35.0	39.0
3rd highest	21.0	21.0	22.8	23.3	28.6	30.7	32.7	32.9	36.5
Lowest rated	18.8	17.9	20.3	22.3	33.5	37.5	40.3	41.3	38.8
Nonrated	16.1	16.4	19.8	23.4	28.8	31.7	37.5	37.9	40.6
Physical, environmental sciences, foreign	19.5	19.0	18.8	19.3	21.4	22.7	24.4	24.2	25.3
Highest	15.8	16.5	16.0	15.8	17.0	16.8	18.5	19.5	21.3
2nd highest	19.4	18.8	17.8	18.1	19.0	20.8	22.5	22.5	23.8
3rd highest	17.8	16.5	16.3	16.8	20.3	22.1	24.0	24.5	25.5
Lowest rated	22.2	22.7	22.9	24.2	26.8	28.2	29.9	29.3	29.2
Nonrated	24.4	20.8	22.2	22.8	24.7	26.1	27.3	24.0	25.9
Biological sciences, foreign	10.1	9.3	9.3	9.4	10.9	11.4	12.4	13.5	14.9
Highest	11.5	10.3	10.5	9.7	10.9	11.3	12.0	11.7	11.8
2nd highest	9.3	10.1	9.3	9.0	11.3	11.0	12.6	14.2	16.8
3rd highest	9.2	8.3	7.7	8.1	9.9	10.7	11.2	12.9	14.3
Lowest rated	10.6	9.2	10.5	10.8	11.9	12.4	13.2	13.7	15.8
Nonrated	9.9	9.1	8.4	8.7	10.1	11.5	12.7	14.6	15.0
Psychology, social sciences, foreign	10.1	10.2	10.4	11.4	14.7	16.0	16.4	16.4	17.0
Highest	14.7	14.5	14.8	16.1	17.5	17.4	19.9	17.9	18.8
2nd highest	8.9	8.4	8.2	8.6	12.0	13.1	14.8	15.5	16.8
3rd highest	10.2	10.6	10.9	12.4	15.8	17.9	19.4	19.9	20.6
Lowest rated	9.2	9.3	9.5	10.7	12.9	14.7	14.6	14.3	14.9
Nonrated	8.6	9.7	10.3	10.2	17.1	17.3	14.4	15.1	14.1

SOURCES: Council of Graduate Schools, National Research Council, and the National Science Foundation

Table B-21. Ph.D. recipients in science/engineering by field and citizenship status: 1960-85

Field and year	Total	Number					Percentage distribution				
				Foreign					Foreign		
		Citizenship known	United States	Total	Immigrant (permanent visas)	Nonimmigrant (temporary visas)	Citizenship known	United States	Total	Immigrant (permanent visas)	Nonimmigrant (temporary visas)
Total, science/engineering											
1960	6,263	6,216	5,261	955	219	736	100.00	84.64	15.36	3.52	11.84
1961	6,721	6,630	5,584	1,046	200	846	100.00	84.22	15.78	3.02	12.76
1962	7,438	7,350	6,133	1,217	196	1,021	100.00	83.44	16.56	2.67	13.89
1963	8,219	8,087	6,794	1,293	279	1,014	100.00	84.01	15.99	3.45	12.54
1964	9,224	9,043	7,494	1,549	367	1,182	100.00	82.87	17.13	4.06	13.07
1965	10,476	10,321	8,460	1,861	436	1,425	100.00	81.97	18.03	4.22	13.81
1966	11,458	11,162	9,115	2,047	451	1,596	100.00	81.66	18.34	4.04	14.30
1967	12,982	12,733	10,384	2,349	679	1,670	100.00	81.55	18.45	5.33	13.12
1968	14,448	14,202	11,632	2,570	765	1,805	100.00	81.90	18.10	5.39	12.71
1969	16,039	15,716	12,908	2,808	938	1,870	100.00	82.13	17.87	5.97	11.90
1970	17,743	17,564	14,326	3,238	1,219	2,019	100.00	81.56	18.44	6.94	11.50
1971	18,949	18,675	15,124	3,551	1,465	2,086	100.00	80.99	19.01	7.84	11.17
1972	19,008	18,700	14,907	3,793	1,624	2,169	100.00	79.72	20.28	8.68	11.60
1973	19,001	18,673	14,683	3,990	1,563	2,427	100.00	78.63	21.37	8.37	13.00
1974	18,313	17,482	13,458	4,024	1,382	2,642	100.00	76.98	23.02	7.91	15.11
1975	18,358	18,003	14,015	3,988	1,246	2,742	100.00	77.85	22.15	6.92	15.23
1976	17,864	17,526	13,773	3,753	1,078	2,675	100.00	78.59	21.41	6.15	15.26
1977	17,417	16,988	13,407	3,581	979	2,602	100.00	78.92	21.08	5.76	15.32
1978	17,048	16,562	13,086	3,476	970	2,506	100.00	79.01	20.99	5.86	15.13
1979	17,245	16,790	13,257	3,533	927	2,606	100.00	78.96	21.04	5.52	15.52
1980	17,199	16,757	13,179	3,578	935	2,643	100.00	78.65	21.35	5.58	15.77
1981	17,633	17,066	13,298	3,768	876	2,892	100.00	77.92	22.08	5.13	16.95
1982	17,626	16,907	13,022	3,885	834	3,051	100.00	77.02	22.98	4.93	18.05
1983	17,932	17,287	13,083	4,204	876	3,328	100.00	75.68	24.32	5.07	19.25
1984	18,069	17,361	12,941	4,420	816	3,604	100.00	74.54	25.46	4.70	20.76
1985	18,255	17,468	12,621	4,847	897	3,950	100.00	72.25	27.75	5.14	22.61
Physical sciences											
1960	1,608	1,597	1,413	184	41	143	100.00	88.48	11.52	2.57	8.95
1961	1,747	1,719	1,482	237	50	187	100.00	86.21	13.79	2.91	10.88
1962	1,848	1,827	1,578	249	42	207	100.00	86.37	13.63	2.30	11.33
1963	2,105	2,060	1,785	275	48	227	100.00	86.65	13.35	2.33	11.02
1964	2,217	2,173	1,862	311	80	231	100.00	85.69	14.31	3.68	10.63
1965	2,490	2,457	2,092	365	85	280	100.00	85.14	14.86	3.46	11.40
1966	2,655	2,576	2,173	403	97	306	100.00	84.36	15.64	3.77	11.88
1967	3,085	3,024	2,524	500	143	357	100.00	83.47	16.53	4.73	11.81
1968	3,239	3,175	2,717	458	126	332	100.00	85.57	14.43	3.97	10.46
1969	3,428	3,346	2,841	505	170	335	100.00	84.91	15.09	5.08	10.01
1970	3,893	3,837	3,211	626	263	363	100.00	83.69	16.31	6.85	9.46
1971	3,949	3,877	3,209	668	305	363	100.00	82.77	17.23	7.87	9.36
1972	3,653	3,598	2,889	709	322	387	100.00	80.29	19.71	8.95	10.76
1973	3,444	3,384	2,644	740	303	437	100.00	78.13	21.87	8.95	12.91
1974	3,136	3,009	2,339	670	257	413	100.00	77.73	22.27	8.54	13.73
1975	3,076	3,011	2,317	694	236	458	100.00	76.95	23.05	7.84	15.21
1976	2,861	2,823	2,175	648	217	431	100.00	77.05	22.95	7.69	15.27
1977	2,721	2,668	2,071	597	191	406	100.00	77.62	22.38	7.16	15.22
1978	2,611	2,558	1,978	580	183	397	100.00	77.33	22.67	7.15	15.52
1979	2,674	2,620	2,040	580	165	415	100.00	77.86	22.14	6.30	15.84
1980	2,521	2,461	1,884	577	151	426	100.00	76.55	23.45	6.14	17.31
1981	2,627	2,545	1,956	589	147	442	100.00	76.86	23.14	5.78	17.37
1982	2,694	2,616	1,991	625	119	506	100.00	76.11	23.89	4.55	19.34
1983	2,802	2,723	2,064	659	120	539	100.00	75.80	24.20	4.41	19.79
1984	2,845	2,753	2,071	682	118	564	100.00	75.23	24.77	4.29	20.49
1985	2,914	2,794	2,040	754	135	619	100.00	73.01	26.99	4.83	22.15

Table B-21. Ph.D. recipients in science/engineering by field and citizenship status: 1960-85—Con.

		Number					Percentage distribution				
				Foreign					Foreign		
Field and year	Total	Citizenship known	United States	Total	Immigrant (permanent visas)	Nonimmigrant (temporary visas)	Citizenship known	United States	Total	Immigrant (permanent visas)	Nonimmigrant (temporary visas)
Earth, marine, and environmental sciences											
1960	253	251	206	45	10	35	100.00	82.07	17.93	3.98	13.94
1961	246	246	209	37	3	34	100.00	84.96	15.04	1.22	13.82
1962	249	247	221	26	3	23	100.00	89.47	10.53	1.21	9.31
1963	322	317	254	63	12	51	100.00	80.13	19.87	3.79	16.09
1964	310	301	252	49	11	38	100.00	83.72	16.28	3.65	12.62
1965	375	372	305	67	21	46	100.00	81.99	18.01	5.65	12.37
1966	404	396	334	62	10	52	100.00	84.34	15.66	2.53	13.13
1967	418	406	333	73	14	59	100.00	82.02	17.98	3.45	14.53
1968	442	433	350	83	17	66	100.00	80.83	19.17	3.93	15.24
1969	507	496	388	108	30	78	100.00	78.23	21.77	6.05	15.73
1970	510	504	400	104	33	71	100.00	79.37	20.63	6.55	14.09
1971	552	551	467	84	39	45	100.00	84.75	15.25	7.08	8.17
1972	604	595	473	122	58	64	100.00	79.50	20.50	9.75	10.76
1973	634	627	505	122	49	73	100.00	80.54	19.46	7.81	11.64
1974	629	605	457	148	47	101	100.00	75.54	24.46	7.77	16.69
1975	634	625	492	133	38	95	100.00	78.72	21.28	6.08	15.20
1976	645	636	508	128	32	96	100.00	79.87	20.13	5.03	15.09
1977	694	681	559	122	22	100	100.00	82.09	17.91	3.23	14.68
1978	623	608	518	90	22	68	100.00	85.20	14.80	3.62	11.18
1979	646	637	532	105	34	71	100.00	83.52	16.48	5.34	11.15
1980	628	618	512	106	26	80	100.00	82.85	17.15	4.21	12.94
1981	583	573	472	101	16	85	100.00	82.37	17.63	2.79	14.83
1982	657	638	528	110	29	81	100.00	82.76	17.24	4.55	12.70
1983	637	619	483	136	30	106	100.00	78.03	21.97	4.85	17.12
1984	614	605	474	131	25	106	100.00	78.35	21.65	4.13	17.52
1985	617	592	444	148	31	117	100.00	75.00	25.00	5.24	19.76
Mathematics											
1960	291	288	233	55	11	44	100.00	80.90	19.10	3.82	15.28
1961	332	323	271	52	8	44	100.00	83.90	16.10	2.48	13.62
1962	388	384	309	75	10	65	100.00	80.47	19.53	2.60	16.93
1963	483	473	398	75	14	61	100.00	84.14	15.86	2.96	12.90
1964	588	578	486	92	12	80	100.00	84.08	15.92	2.08	13.84
1965	685	670	575	95	19	76	100.00	85.82	14.18	2.84	11.34
1966	769	753	631	122	25	97	100.00	83.80	16.20	3.32	12.88
1967	830	811	682	129	37	92	100.00	84.09	15.91	4.56	11.34
1968	971	953	797	156	44	112	100.00	83.63	16.37	4.62	11.75
1969	1,070	1,051	885	166	52	114	100.00	84.21	15.79	4.95	10.85
1970	1,225	1,210	1,018	192	58	134	100.00	84.13	15.87	4.79	11.07
1971	1,238	1,226	1,009	217	65	152	100.00	82.30	17.70	5.30	12.40
1972	1,281	1,264	1,030	234	65	169	100.00	81.49	18.51	5.14	13.37
1973	1,233	1,206	952	254	81	173	100.00	78.94	21.06	6.72	14.34
1974	1,211	1,171	876	295	71	224	100.00	74.81	25.19	6.06	19.13
1975	1,147	1,120	848	272	75	197	100.00	75.71	24.29	6.70	17.59
1976	1,003	986	748	238	55	183	100.00	75.86	24.14	5.58	18.56
1977	933	911	690	221	54	167	100.00	75.74	24.26	5.93	18.33
1978	838	821	619	202	47	155	100.00	75.40	24.60	5.72	18.88
1979	769	752	552	244	63	181	100.00	73.40	32.45	8.38	24.07
1980	744	721	520	201	62	139	100.00	72.12	27.88	8.60	19.28
1981	728	711	482	229	43	186	100.00	67.79	32.21	6.05	26.16
1982	720	691	458	233	41	192	100.00	66.28	33.72	5.93	27.79
1983	701	666	411	255	46	209	100.00	61.71	38.29	6.91	31.38
1984	699	675	407	268	36	232	100.00	60.30	39.70	5.33	34.37
1985	689	657	376	281	42	239	100.00	57.23	42.77	6.39	36.38

Table B-21. Ph.D. recipients in science/engineering by field and citizenship status: 1960-85—Con.

Field and year	Total	Number					Percentage distribution				
		Citizenship known	United States	Foreign			Citizenship known	United States	Foreign		
				Total	Immigrant (permanent visas)	Nonimmigrant (temporary visas)			Total	Immigrant (permanent visas)	Nonimmigrant (temporary visas)
Computer sciences											
1977	31	28	24	4	1	3	100.00	85.71	14.29	3.57	10.71
1978	121	116	85	31	5	26	100.00	73.28	26.72	4.31	22.41
1979	210	207	163	44	12	32	100.00	78.74	21.26	5.80	15.46
1980	218	212	156	56	13	43	100.00	73.58	26.42	6.13	20.28
1981	232	228	168	60	20	40	100.00	73.68	26.32	8.77	17.54
1982	220	214	143	71	12	59	100.00	66.82	33.18	5.61	27.57
1983	286	279	180	99	27	72	100.00	64.52	35.48	9.68	25.81
1984	295	283	177	106	17	89	100.00	62.54	37.46	6.01	31.45
1985	311	302	189	113	24	89	100.00	62.58	37.42	7.95	29.47
Agricultural sciences											
1960	414	413	306	107	16	91	100.00	74.09	25.91	3.87	22.03
1961	438	436	338	98	6	92	100.00	77.52	22.48	1.38	21.10
1962	470	470	340	130	18	112	100.00	72.34	27.66	3.83	23.83
1963	466	462	360	102	12	90	100.00	77.92	22.08	2.60	19.48
1964	517	515	363	152	17	135	100.00	70.49	29.51	3.30	26.21
1965	576	569	377	192	20	172	100.00	66.26	33.74	3.51	30.23
1966	576	565	375	190	15	175	100.00	66.37	33.63	2.65	30.97
1967	606	603	399	204	22	182	100.00	66.17	33.83	3.65	30.18
1968	684	675	438	237	41	196	100.00	64.89	35.11	6.07	29.04
1969	723	718	481	237	35	202	100.00	66.99	33.01	4.87	28.13
1970	804	801	555	246	47	199	100.00	69.29	30.71	5.87	24.84
1971	903	900	587	313	76	237	100.00	65.22	34.78	8.44	26.33
1972	854	850	533	317	85	232	100.00	62.71	37.29	10.00	27.29
1973	855	851	542	309	75	234	100.00	63.69	36.31	8.81	27.50
1974	820	797	461	336	65	271	100.00	57.84	42.16	8.16	34.00
1975	905	900	563	337	70	267	100.00	62.56	37.44	7.78	29.67
1976	788	780	499	281	37	244	100.00	63.97	36.03	4.74	31.28
1977	782	771	487	284	27	257	100.00	63.16	36.84	3.50	33.33
1978	853	840	530	310	43	267	100.00	63.10	36.90	5.12	31.79
1979	855	838	544	294	29	265	100.00	64.92	35.08	3.46	31.62
1980	912	901	570	331	35	296	100.00	63.26	36.74	3.88	32.85
1981	982	954	594	360	35	325	100.00	62.26	37.74	3.67	34.07
1982	951	930	647	283	23	260	100.00	69.57	30.43	2.47	27.96
1983	1,015	992	649	343	36	307	100.00	65.42	34.58	3.63	30.95
1984	997	972	625	347	35	312	100.00	64.30	35.70	3.60	32.10
1985	1,111	1,081	683	398	43	355	100.00	63.18	36.82	3.98	32.84

Table B-21. Ph.D. recipients in science/engineering by field and citizenship status: 1960-85—Con.

Field and year	Total	Number					Percentage distribution				
		Citizenship known	United States	Foreign			Citizenship known	United States	Foreign		
				Total	Immigrant (permanent visas)	Nonimmigrant (temporary visas)			Total	Immigrant (permanent visas)	Nonimmigrant (temporary visas)
Biological sciences											
1960	1,246	1,236	1,048	188	40	148	100.00	84.79	15.21	3.24	11.97
1961	1,244	1,228	1,016	212	39	173	100.00	82.74	17.26	3.18	14.09
1962	1,397	1,382	1,156	226	25	201	100.00	83.65	16.35	1.81	14.54
1963	1,510	1,498	1,243	255	46	209	100.00	82.98	17.02	3.07	13.95
1964	1,702	1,669	1,359	310	60	250	100.00	81.43	18.57	3.59	14.98
1965	1,963	1,943	1,570	373	66	307	100.00	80.80	19.20	3.40	15.80
1966	2,135	2,105	1,725	380	67	313	100.00	81.95	18.05	3.18	14.87
1967	2,360	2,324	1,926	398	100	298	100.00	82.87	17.13	4.30	12.82
1968	2,827	2,796	2,303	493	133	360	100.00	82.37	17.63	4.76	12.88
1969	3,092	3,052	2,571	481	141	340	100.00	84.24	15.76	4.62	11.14
1970	3,361	3,336	2,804	532	171	361	100.00	84.05	15.95	5.13	10.82
1971	3,654	3,576	3,056	520	208	312	100.00	85.46	14.54	5.82	8.72
1972	3,600	3,521	2,994	527	222	305	100.00	85.03	14.97	6.31	8.66
1973	4,503	4,423	3,556	867	319	548	100.00	80.40	19.60	7.21	12.39
1974	3,484	3,320	2,749	571	208	363	100.00	82.80	17.20	6.27	10.93
1975	3,497	3,417	2,910	507	190	317	100.00	85.16	14.84	5.56	9.28
1976	3,573	3,473	2,998	475	162	313	100.00	86.32	13.68	4.66	9.01
1977	3,484	3,389	2,909	480	162	318	100.00	85.84	14.16	4.78	9.38
1978	3,516	3,426	2,992	434	142	292	100.00	87.33	12.67	4.14	8.52
1979	3,646	3,559	3,130	429	132	297	100.00	87.95	12.05	3.71	8.35
1980	3,803	3,726	3,279	447	151	296	100.00	88.00	12.00	4.05	7.94
1981	3,804	3,709	3,297	412	124	288	100.00	88.89	11.11	3.34	7.76
1982	3,890	3,778	3,318	460	117	343	100.00	87.82	12.18	3.10	9.08
1983	3,736	3,646	3,210	436	114	322	100.00	88.04	11.96	3.13	8.83
1984	3,872	3,753	3,279	474	114	360	100.00	87.37	12.63	3.04	9.59
1985	3,766	3,656	3,126	530	108	422	100.00	85.50	14.50	2.95	11.54
Psychology											
1960	772	769	728	41	14	27	100.00	94.67	5.33	1.82	3.51
1961	820	811	779	32	10	22	100.00	96.05	3.95	1.23	2.71
1962	856	846	790	56	13	43	100.00	93.38	6.62	1.54	5.08
1963	890	882	845	37	14	23	100.00	95.80	4.20	1.59	2.61
1964	1,013	1,003	938	65	28	37	100.00	93.52	6.48	2.79	3.69
1965	954	946	905	41	14	27	100.00	95.67	4.33	1.48	2.85
1966	1,139	1,117	1,051	66	25	41	100.00	94.09	5.91	2.24	3.67
1967	1,295	1,276	1,219	57	21	36	100.00	95.53	4.47	1.65	2.82
1968	1,464	1,448	1,374	74	32	42	100.00	94.89	5.11	2.21	2.90
1969	1,766	1,732	1,642	90	29	61	100.00	94.80	5.20	1.67	3.52
1970	1,890	1,874	1,775	99	41	58	100.00	94.72	5.28	2.19	3.09
1971	2,145	2,113	1,992	121	50	71	100.00	94.27	5.73	2.37	3.36
1972	2,279	2,247	2,118	129	51	78	100.00	94.26	5.74	2.27	3.47
1973	2,458	2,415	2,285	130	50	80	100.00	94.62	5.38	2.07	3.31
1974	2,598	2,475	2,344	131	47	84	100.00	94.71	5.29	1.90	3.39
1975	2,751	2,708	2,552	156	55	101	100.00	94.24	5.76	2.03	3.73
1976	2,883	2,854	2,727	127	41	86	100.00	95.55	4.45	1.44	3.01
1977	2,990	2,894	2,774	120	47	73	100.00	95.85	4.15	1.62	2.52
1978	3,055	2,919	2,804	115	54	61	100.00	96.06	3.94	1.85	2.09
1979	3,091	2,968	2,850	118	45	73	100.00	96.02	3.98	1.52	2.46
1980	3,098	2,980	2,859	121	50	71	100.00	95.94	4.06	1.68	2.38
1981	3,358	3,238	3,111	127	47	80	100.00	96.08	3.92	1.45	2.47
1982	3,158	2,987	2,875	112	47	65	100.00	96.25	3.75	1.57	2.18
1983	3,308	3,167	3,025	142	63	79	100.00	95.52	4.48	1.99	2.49
1984	3,223	3,043	2,905	138	51	87	100.00	95.47	4.53	1.68	2.86
1985	3,075	2,912	2,772	140	58	82	100.00	95.19	4.81	1.99	2.82

Table B-21. Ph.D. recipients in science/engineering by field and citizenship status: 1960-85—Con.

Field and year	Total	Number					Percentage distribution				
				Foreign					Foreign		
		Citizenship known	United States	Total	Immigrant (permanent visas)	Nonimmigrant (temporary visas)	Citizenship known	United States	Total	Immigrant (permanent visas)	Nonimmigrant (temporary visas)
Social sciences											
1960	885	872	720	152	33	119	100.00	82.57	17.43	3.78	13.65
1961	954	933	764	169	29	140	100.00	81.89	18.11	3.11	15.01
1962	1,014	986	809	177	25	152	100.00	82.05	17.95	2.54	15.42
1963	1,086	1,053	867	186	48	138	100.00	82.34	17.66	4.56	13.11
1964	1,213	1,160	946	214	50	164	100.00	81.55	18.45	4.31	14.14
1965	1,359	1,331	1,060	271	73	198	100.00	79.64	20.36	5.48	14.88
1966	1,479	1,431	1,136	295	68	227	100.00	79.39	20.61	4.75	15.86
1967	1,784	1,725	1,375	350	113	237	100.00	79.71	20.29	6.55	13.74
1968	1,966	1,908	1,548	360	99	261	100.00	81.13	18.87	5.19	13.68
1969	2,188	2,125	1,713	412	132	280	100.00	80.61	19.39	6.21	13.18
1970	2,626	2,587	2,049	538	176	362	100.00	79.20	20.80	6.80	13.99
1971	3,010	2,966	2,386	580	192	388	100.00	80.45	19.55	6.47	13.08
1972	3,234	3,154	2,540	614	199	415	100.00	80.53	19.47	6.31	13.16
1973	3,365	3,297	2,599	698	204	494	100.00	78.83	21.17	6.19	14.98
1974	3,288	3,134	2,480	654	172	482	100.00	79.13	20.87	5.49	15.38
1975	3,346	3,273	2,617	656	164	492	100.00	79.96	20.04	5.01	15.03
1976	3,277	3,214	2,561	653	144	509	100.00	79.68	20.32	4.48	15.84
1977	3,139	3,075	2,421	654	149	505	100.00	78.73	21.27	4.85	16.42
1978	3,008	2,920	2,299	621	149	472	100.00	78.73	21.27	5.10	16.16
1979	2,864	2,779	2,153	626	137	489	100.00	77.47	22.53	4.93	17.60
1980	2,796	2,733	2,144	589	148	441	100.00	78.45	21.55	5.42	16.14
1981	2,791	2,695	2,048	647	143	504	100.00	75.99	24.01	5.31	18.70
1982	2,690	2,558	1,893	665	150	515	100.00	74.00	26.00	5.86	20.13
1983	2,666	2,543	1,898	645	121	524	100.00	74.64	25.36	4.76	20.61
1984	2,609	2,495	1,763	732	146	586	100.00	70.66	29.34	5.85	23.49
1985	2,607	2,467	1,712	755	141	614	100.00	69.40	30.60	5.72	24.89
Total sciences											
1960	5,469	5,426	4,654	772	165	607	100.00	85.77	14.23	3.04	11.19
1961	5,781	5,696	4,859	837	145	692	100.00	85.31	14.69	2.55	12.15
1962	6,222	6,142	5,203	939	136	803	100.00	84.71	15.29	2.21	13.07
1963	6,862	6,745	5,752	993	194	799	100.00	85.28	14.72	2.88	11.85
1964	7,560	7,399	6,206	1,193	258	935	100.00	83.88	16.12	3.49	12.64
1965	8,402	8,288	6,884	1,404	298	1,106	100.00	83.06	16.94	3.60	13.34
1966	9,157	8,943	7,425	1,518	307	1,211	100.00	83.03	16.97	3.43	13.54
1967	10,378	10,169	8,458	1,711	450	1,261	100.00	83.17	16.83	4.43	12.40
1968	11,593	11,388	9,527	1,861	492	1,369	100.00	83.66	16.34	4.32	12.02
1969	12,774	12,520	10,521	1,999	589	1,410	100.00	84.03	15.97	4.70	11.26
1970	14,309	14,149	11,812	2,337	789	1,548	100.00	83.48	16.52	5.58	10.94
1971	15,451	15,209	12,706	2,503	935	1,568	100.00	83.54	16.46	6.15	10.31
1972	15,505	15,229	12,577	2,652	1,002	1,650	100.00	82.59	17.41	6.58	10.83
1973	15,637	15,352	12,541	2,811	1,006	1,805	100.00	81.69	18.31	6.55	11.76
1974	15,166	14,511	11,706	2,805	867	1,938	100.00	80.67	19.33	5.97	13.36
1975	15,356	15,054	12,299	2,755	828	1,927	100.00	81.70	18.30	5.50	12.80
1976	15,030	14,766	12,216	2,550	688	1,862	100.00	82.73	17.27	4.66	12.61
1977	14,774	14,417	11,935	2,482	653	1,829	100.00	82.78	17.22	4.53	12.69
1978	14,625	14,208	11,825	2,383	645	1,738	100.00	83.23	16.77	4.54	12.23
1979	14,755	14,360	11,964	2,396	605	1,791	100.00	83.31	16.69	4.21	12.47
1980	14,720	14,352	11,924	2,428	636	1,792	100.00	83.08	16.92	4.43	12.49
1981	15,105	14,653	12,128	2,525	575	1,950	100.00	82.77	17.23	3.92	13.31
1982	14,980	14,412	11,853	2,559	538	2,021	100.00	82.24	17.76	3.73	14.02
1983	15,151	14,635	11,920	2,715	557	2,158	100.00	81.45	18.55	3.81	14.75
1984	15,161	14,579	11,701	2,878	542	2,336	100.00	80.26	19.74	3.72	16.02
1985	15,090	14,461	11,342	3,119	582	2,537	100.00	78.43	21.57	4.02	17.54

Table B-21. Ph.D. recipients in science/engineering by field and citizenship status: 1960-85—Con.

		Number					Percentage distribution				
				Foreign					Foreign		
Field and year	Total	Citizenship known	United States	Total	Immigrant (permanent visas)	Nonimmigrant (temporary visas)	Citizenship known	United States	Total	Immigrant (permanent visas)	Nonimmigrant (temporary visas)
Total engineering											
1960	794	790	607	183	54	129	100.00	76.84	23.16	6.84	16.33
1961	940	934	725	209	55	154	100.00	77.62	22.38	5.89	16.49
1962	1,216	1,208	930	278	60	218	100.00	76.99	23.01	4.97	18.05
1963	1,357	1,342	1,042	300	85	215	100.00	77.65	22.35	6.33	16.02
1964	1,664	1,644	1,288	356	109	247	100.00	78.35	21.65	6.63	15.02
1965	2,074	2,033	1,576	457	138	319	100.00	77.52	22.48	6.79	15.69
1966	2,301	2,219	1,690	529	144	385	100.00	76.16	23.84	6.49	17.35
1967	2,604	2,564	1,926	638	229	409	100.00	75.12	24.88	8.93	15.95
1968	2,855	2,814	2,105	709	273	436	100.00	74.80	25.20	9.70	15.49
1969	3,265	3,196	2,387	809	349	460	100.00	74.69	25.31	10.92	14.39
1970	3,434	3,415	2,514	901	430	471	100.00	73.62	26.38	12.59	13.79
1971	3,498	3,466	2,418	1,048	530	518	100.00	69.76	30.24	15.29	14.95
1972	3,503	3,471	2,330	1,141	622	519	100.00	67.13	32.87	17.92	14.95
1973	3,364	3,321	2,142	1,179	557	622	100.00	64.50	35.50	16.77	16.73
1974	3,147	2,971	1,752	1,219	515	704	100.00	58.97	41.03	17.33	23.70
1975	3,002	2,949	1,716	1,233	418	815	100.00	58.19	41.81	14.17	27.64
1976	2,834	2,760	1,557	1,203	390	813	100.00	56.41	43.59	14.13	29.46
1977	2,643	2,571	1,472	1,099	326	773	100.00	57.25	42.75	12.68	30.07
1978	2,423	2,354	1,261	1,093	325	768	100.00	53.57	46.43	13.81	32.63
1979	2,490	2,430	1,293	1,137	322	815	100.00	53.21	46.79	13.25	33.54
1980	2,479	2,405	1,255	1,150	299	851	100.00	52.18	47.82	12.43	35.39
1981	2,528	2,413	1,170	1,243	301	942	100.00	48.49	51.51	12.47	39.04
1982	2,646	2,495	1,169	1,326	296	1,030	100.00	46.85	53.15	11.86	41.28
1983	2,781	2,652	1,163	1,489	319	1,170	100.00	43.85	56.15	12.03	44.12
1984	2,913	2,782	1,240	1,542	274	1,268	100.00	44.57	55.43	9.85	45.58
1985	3,165	3,007	1,279	1,728	315	1,413	100.00	42.53	57.47	10.48	46.99

SOURCES: National Science Foundation and the National Research Council

Table B-22. Percent of doctorates in science/engineering awarded to women by citizenship status: 1960-85

Year	U.S. citizens		Foreign citizens					
			Total		Permanent visas		Temporary visas	
	Total number	Percent women	Total number	Percent women	Total number	Percent women	Total number	Percent women
1960	5,261	7.1	955	6.8	219	8.2	736	6.4
1961	5,584	7.4	1,046	6.8	200	8.5	846	6.4
1962	6,133	7.3	1,217	6.7	196	8.2	1,021	6.5
1963	6,794	7.4	1,293	6.7	279	6.1	1,014	6.9
1964	7,494	7.5	1,549	7.0	367	10.1	1,182	6.1
1965	8,460	7.4	1,861	5.8	436	9.4	1,425	4.7
1966	9,115	8.1	2,047	7.3	451	7.8	1,596	7.2
1967	10,384	8.6	2,349	7.0	679	6.9	1,670	7.1
1968	11,632	9.4	2,570	7.3	765	9.7	1,805	6.3
1969	12,908	9.7	2,808	7.5	938	8.3	1,870	7.1
1970	14,326	9.5	3,238	7.9	1,219	9.4	2,019	7.0
1971	15,124	10.7	3,551	8.3	1,465	10.5	2,086	6.7
1972	14,907	11.6	3,793	8.5	1,624	11.3	2,169	6.5
1973	14,683	13.9	3,990	9.0	1,563	11.4	2,427	7.5
1974	13,458	15.6	4,024	9.3	1,382	11.9	2,642	8.0
1975	14,015	17.2	3,988	9.4	1,246	12.3	2,742	8.1
1976	13,773	18.4	3,753	10.7	1,078	14.9	2,675	9.0
1977	13,407	19.6	3,581	11.4	979	14.6	2,602	10.3
1978	13,086	21.3	3,476	11.9	970	16.8	2,506	10.1
1979	13,257	23.0	3,533	12.2	927	17.5	2,606	10.4
1980	13,179	24.8	3,578	12.2	935	20.0	2,643	9.4
1981	13,298	25.7	3,768	13.0	876	19.6	2,892	11.0
1982	13,022	27.1	3,885	12.0	834	18.8	3,051	10.1
1983	13,083	25.1	4,204	12.2	876	20.3	3,328	10.0
1984	12,941	29.7	4,420	12.8	816	19.4	3,604	11.3
1985	12,621	30.0	4,847	13.9	897	20.0	3,950	12.5

SOURCES: National Science Foundation and the National Research Council

Table B-23. Science doctorates awarded to U.S. citizens per thousand U.S. population by sex: 1970-85

Year	Science doctorates to U.S. citizens						30-year-old population (thousands)		
	Total		Men		Women				
	(Number)	(per 000)	(Number)	(per 000)	(Number)	(per 000)	Total	Men	Women
				Actual					
1970	11,812	4.75	10,469	8.50	1,343	1.07	2,488	1,232	1,256
1971	12,706	4.83	11,090	8.49	1,616	1.22	2,632	1,306	1,326
1972	12,577	4.50	10,858	7.82	1,719	1.22	2,795	1,388	1,407
1973	12,541	3.95	10,514	6.66	2,027	1.27	3,178	1,579	1,599
1974	11,706	3.89	9,626	6.45	2,080	1.37	3,008	1,492	1,516
1975	12,299	4.15	9,920	6.73	2,379	1.59	2,966	1,473	1,493
1976	12,216	4.19	9,715	6.69	2,501	1.71	2,913	1,452	1,461
1977	11,935	2.98	9,349	4.68	2,586	1.29	4,000	1,999	2,001
1978	11,842	3.18	9,063	4.89	2,779	1.49	3,721	1,855	1,866
1979	11,964	3.20	8,959	4.82	3,005	1.60	3,734	1,857	1,877
1980	11,924	3.19	8,717	4.69	3,207	1.71	3,737	1,860	1,877
1981	12,128	3.12	8,767	4.53	3,361	1.72	3,886	1,935	1,951
1982	11,853	2.97	8,394	4.21	3,459	1.73	3,990	1,993	1,997
1983	11,922	2.90	8,183	3.99	3,739	1.82	4,107	2,053	2,054
1984	11,716	2.77	7,952	3.76	3,764	1.78	4,225	2,114	2,111
1985	11,342	2.62	7,669	3.54	3,673	1.71	4,322	2,169	2,154

SOURCES: National Science Foundation and Department of Commerce, Bureau of the Census, *Current Population Reports*, Series P-25

Table B-24. Citizenship status of doctorate recipients in selected engineering fields: 1978 and 1985

	Number						Percentage distribution				
				Foreign					Foreign		
Field and year	Total	Citizenship known	United States	Total	Immigrant (permanent visas)	Non-immigrant (temporary visas)	Citizenship known	United States	Total	Immigrant (permanent visas)	Non-immigrant (temporary visas)
Total—engineering											
1978	2,423	2,354	1,261	1,093	325	768	100.0	53.7	46.4	13.8	32.6
1985	3,165	3,007	1,279	1,728	315	1,413	100.0	42.6	57.5	10.5	47.0
Aeronautical/astronautical											
1978	103	101	48	53	14	39	100.0	47.5	52.5	13.9	38.6
1985	124	121	53	68	17	51	100.0	43.8	56.2	14.0	42.1
Chemical											
1978	261	256	127	129	46	83	100.0	49.6	50.4	18.0	32.4
1985	440	429	218	211	39	172	100.0	50.8	49.2	9.1	40.1
Civil											
1978	236	228	91	137	27	110	100.0	39.9	60.1	11.8	48.2
1985	357	343	114	229	38	191	100.0	33.2	66.8	11.1	55.7
Electrical/electronic											
1978	463	444	244	200	59	141	100.0	55.0	45.0	13.3	31.7
1985	631	585	247	338	65	273	100.0	42.2	57.8	11.1	46.7
Industrial											
1978	51	51	35	16	5	11	100.0	68.6	31.4	9.8	21.6
1985	92	85	28	57	9	48	100.0	32.9	67.1	10.6	56.5
Materials science											
1978	125	124	71	53	17	36	100.0	57.3	42.7	13.7	29.0
1985	188	180	89	91	13	78	100.0	49.4	50.6	7.2	43.3
Mechanical											
1978	282	278	149	129	44	85	100.0	57.3	42.7	13.7	29.0
1985	424	405	161	244	53	191	100.0	39.8	60.2	13.1	47.2
Nuclear											
1978	107	105	61	44	17	27	100.0	58.1	41.9	16.2	25.7
1985	96	91	38	53	5	48	100.0	41.8	58.2	5.5	52.7

SOURCES: National Science Foundation and National Research Council

Table B-25. Engineering doctorates awarded to U.S. citizens per thousand U.S. population by sex: 1970-85

Year	Engineering doctorates to U.S. citizens						30-year-old U.S. population (thousands)		
	Total		Men		Women				
	(Number)	(per 000)	(Number)	(per 000)	(Number)	(per 000)	Total	Men	Women
	Actual								
1970	2,514	1.01	2,503	2.03	11	0.01	2,488	1,232	1,256
1971	2,418	.92	2,415	1.85	3	.00	2,632	1,306	1,326
1972	2,330	.83	2,314	1.67	16	.01	2,795	1,388	1,407
1973	2,142	.67	2,121	1.34	21	.01	3,178	1,579	1,599
1974	1,752	.58	1,734	1.16	18	.01	3,008	1,492	1,516
1975	1,716	.58	1,684	1.14	32	.02	2,966	1,473	1,493
1976	1,557	.53	1,523	1.05	34	.02	2,913	1,452	1,461
1977	1,472	.37	1,430	.72	42	.02	4,000	1,999	2,001
1978	1,244	.33	1,231	.66	13	.01	3,721	1,855	1,866
1979	1,293	.35	1,254	.68	39	.02	3,734	1,857	1,877
1980	1,255	.34	1,191	.64	64	.03	3,737	1,860	1,877
1981	1,170	.30	1,117	.58	53	.03	3,886	1,935	1,951
1982	1,169	.29	1,095	.55	74	.04	3,990	1,993	1,997
1983	1,173	.29	1,090	.53	83	.04	4,107	2,053	2,054
1984	1,240	.29	1,151	.54	89	.04	4,225	2,114	2,111
1985	1,279	.30	1,160	.53	119	.06	4,322	2,169	2,154

SOURCES: National Science Foundation, and Department of Commerce, Bureau of the Census, *Current Population Reports*, Series P-25

Table B-26. Country of citizenship for non-U.S. citizens awarded science doctorates: selected years

Country of citizenship	Year of doctorate										
	Total 1960-85	1960-64	1965-69	1970-74	1975-79	1980	1981	1982	1983	1984	1985
Total, foreign citizenship	55,127	4,734	8,493	13,107	12,566	2,428	2,525	2,559	2,715	2,881	3,119
Canada	4,677	616	989	1,399	862	130	136	127	152	141	125
Mexico and Central America	1,144	76	151	196	260	54	72	71	92	80	92
Mexico	816	49	103	132	180	44	53	56	67	56	76
Cuba and islands	442	17	88	112	109	19	22	14	12	27	22
South America	3,417	112	337	809	968	211	214	168	190	211	197
Argentina	504	22	67	192	94	15	20	19	24	30	21
Brazil	1,107	19	73	174	364	96	98	63	75	80	65
Chile	524	27	64	124	157	22	24	20	23	28	35
Colombia	397	18	47	108	108	19	16	22	20	21	18
Europe	6,896	554	1,036	1,847	1,556	263	293	296	327	354	370
Belgium	241	13	38	86	46	6	15	8	8	11	10
England	2,116	197	367	610	466	66	82	73	75	87	93
France	17	51	134	125	8	16	24	17	30	17	439
Fed. Rep. Ger./Ger. Dem. Rep.[1]	709	63	123	204	127	22	25	29	39	37	40
Greece	765	68	122	161	190	39	35	37	33	43	37
Italy	334	20	42	73	68	13	15	18	23	25	37
East Asia	12,623	674	1,698	3,210	3,073	525	508	628	697	742	868
China (including Taiwan)[2]	6,493	290	977	1,874	1,493	257	228	303	331	353	387
Hong Kong	950	3	51	194	339	58	66	60	64	53	62
Japan	1,278	150	204	302	282	39	44	54	69	64	70
Korea	2,100	154	307	477	443	83	79	104	128	141	184
Thailand	1,004	46	80	195	315	52	56	65	59	68	68
West Asia	12,422	1,187	2,192	3,034	2,403	528	532	583	622	692	649
India	6,058	788	1,319	1,606	1,084	186	200	194	197	242	242
Iran	1,544	48	132	246	332	125	115	145	130	162	109
Iraq	504	61	116	113	58	21	23	22	36	20	34
Israel	1,196	84	199	322	283	42	58	54	59	54	41
Lebanon	304	30	58	72	72	12	10	13	11	13	13
Turkey	584	19	50	183	171	31	18	25	30	31	26
Pakistan	767	89	200	218	105	32	17	29	25	26	26
Australasia	2,661	244	497	710	511	103	116	116	127	123	114
Australia	902	90	158	255	164	40	32	41	42	45	35
Indonesia, Republic of	426	26	74	79	92	16	35	22	35	23	24
New Zealand	383	37	77	99	83	18	13	13	17	12	14
Philippines	943	91	187	275	172	28	36	40	33	41	40
Africa	4,121	197	593	833	840	212	262	274	283	295	332
Egypt	1,059	112	373	222	92	34	36	44	49	43	54
Nigeria	783			91	258	64	90	76	68	60	76
Country unknown	6,724	1,057	912	957	1,984	383	370	282	213	216	350

[1] Respondents reported that "Germany" was their country of citizenship. Distinguishing between the German Democratic Republic and the Federal Republic of Germany is not possible. Most of the respondents probably are citizens of the Federal Republic of Germany.

[2] Respondents reported that "China" was their country of citizenship. Distinguishing between the People's Republic of China and Taiwan is not possible. Most of the respondents probably are citizens of Taiwan.

SOURCES: National Science Foundation and National Research Council

Table B-27. Country of citizenship for non-U.S. citizens awarded engineering doctorates: selected years

Country of citizenship	Year of doctorate										
	Total 1960-85	1960-64	1965-69	1970-74	1975-79	1980	1981	1982	1983	1984	1985
Total, foreign citizenship	24,200	1,326	3,142	5,488	5,765	1,150	1,243	1,326	1,489	1,543	1,728
Canada	734	97	238	191	86	20	17	18	23	22	22
Mexico and Central America	324	9	36	53	85	17	24	17	34	22	27
Mexico	272	7	26	47	73	13	21	13	29	19	24
Cuba and islands	82	3	19	20	14	2		3	9	5	7
South America	974	24	90	202	276	52	74	65	76	62	53
Argentina	95	0	8	16	21	10	6	5	8	10	11
Brazil	392	10	30	81	114	24	36	29	26	27	15
Chile	121	4	17	31	30	3	10	7	11	2	6
Colombia	115	3	11	35	36	3	3	4	5	11	4
Europe	2,350	159	345	688	514	88	103	113	120	109	111
Belgium	137	7	20	43	29	4	5	7	7	6	9
England	368	QA79	112	63	19	16	16	10	12	6	
France	278	16	35	96	63	6	8	12	14	17	11
Fed. Rep. Ger./Ger. Dem. Rep.[1]	188	11	37	74	35	5	8	6	3	2	7
Greece	444	19	48	98	109	22	28	23	32	35	30
Italy	92	7	13	29	10	2	2	5	7	10	7
East Asia	7,324	310	958	1,670	1,569	304	364	422	481	582	664
China (including Taiwan)[2]	4,600	221	729	1,111	862	174	223	260	279	336	405
Hong Kong	369		12	46	142	27	27	31	30	27	27
Japan	632	39	72	199	139	27	31	31	31	38	25
Korea	1,133	36	114	229	250	41	50	62	104	115	132
Thailand	366	8	22	40	140	20	23	25	27	36	25
West Asia	7,515	340	864	1,846	1,857	357	372	412	491	464	512
India	4,112	203	525	1,242	1,039	184	176	160	178	194	211
Iran	1,137	26	60	169	257	79	74	99	138	119	116
Iraq	137	10	30	40	24	6	4	4	7	6	6
Israel	547	51	89	102	137	21	33	25	45	22	22
Lebanon	147	2	20	31	33	6	8	8	13	15	11
Turkey	678	23	73	152	193	31	30	43	36	41	56
Pakistan	215	9	40	49	47	8	8	13	13	10	18
Australasia	411	30	76	113	68	14	9	21	23	29	28
Australia	136	12	26	49	20	4	4	4	8	5	4
Indonesia, Republic of	98	7	9	14	18	4	4	7	9	11	15
New Zealand	49		11	13	7	4		6		4	4
Philippines	128	11	30	37	23	2	1	4	6	9	5
Africa	1,504	50	149	301	307	96	104	98	125	139	135
Egypt	688	39	106	170	121	39	41	38	43	45	46
Nigeria	243			15	73	20	31	16	29	30	29
Country unknown	2,982	304	367	404	989	200	176	157	107	109	169

[1] Respondents reported that "Germany" was their country of citizenship. Distinguishing between the German Democratic Republic and the Federal Republic of Germany is not possible. Most of the respondents probably are citizens of the Federal Republic of Germany.

[2] Respondents reported that "China" was their country of citizenship. Distinguishing between the People's Republic of China and Taiwan is not possible. Most of the respondents probably are citizens of Taiwan.

SOURCES: National Science Foundation and National Research Council

Table B-28. Country of citizenship for non-U.S. citizens awarded science doctorates by science fields: 1985

Region and selected countries	Total sciences	Physical sciences	Earth, environmental, and marine sciences	Mathematics	Computer sciences	Life sciences	Social sciences	Psychology
Total, foreign	3,119	683	148	281	113	928	755	140
North/Central America	239	35	12	20	3	97	45	26
Canada	125	19	9	10	2	38	26	21
Mexico	76	12	3	9	0	39	11	2
Cuba and islands	22	4	0	1	1	7	6	3
South America	197	38	11	20	6	78	36	8
Argentina	21	2	1	5	1	8	4	0
Brazil	65	7	6	6	3	26	15	2
Chile	35	11	1	6	1	11	5	0
Colombia	18	3	1	2	0	8	2	2
Europe	370	93	22	46	12	89	78	30
Belgium	10	2	1	0	2	2	3	0
England	93	22	6	7	2	31	14	11
France	17	7	2	0	0	4	4	0
Germany	40	3	2	6	1	12	9	7
Greece	37	9	0	7	2	0	11	1
Italy	37	12	2	8	7	5	10	1
East Asia	868	254	51	85	41	229	190	18
China (including Taiwan)	387	128	31	38	19	114	50	7
Hong Kong	62	18	2	10	3	18	9	2
Japan (including Okinawa/ Ryukyus)	70	12	4	6	2	12	29	5
Korea	184	52	8	14	9	35	65	1
Thailand	68	13	1	2	3	25	24	0
West Asia	649	196	17	52	27	161	171	25
India	242	106	5	14	18	56	41	2
Iran	109	26	2	10	2	20	42	7
Iraq	34	1	0	3	1	21	8	0
Israel	41	5	3	4	5	4	9	11
Lebanon	13	5	0	2	0	4	2	0
Pakistan	26	3	1	1	0	14	7	0
Turkey	26	6	3	5	0	4	7	1
Australasia	114	10	7	10	2	45	36	4
Australia	35	3	4	5	0	10	10	3
Indonesia, Republic of	24	3	1	0	0	11	9	0
New Zealand	14	2	1	1	0	8	2	0
Philippines	40	2	1	4	2	15	15	1
Africa	332	38	12	17	9	139	112	5
Egypt	54	11	5	3	5	22	8	0
Nigeria	76	10	2	2	0	30	30	2
Country Unknown	350	90	16	31	13	90	87	23

SOURCES: National Science Foundation and National Research Council

Table B-29. Country of citizenship for non-U.S. citizens awarded engineering doctorates for selected engineering fields: 1984

Country of citizenship	Total engineering	Aeronautical/ astronautical	Chemical	Civil	Electrical/ electronics	Industrial	Materials	Mechanical	Nuclear	Other engineering
Total, non-U.S. citizens	1,542	69	178	207	307	48	91	192	56	394
Canada	22	3	1	3	2			1	1	11
Mexico and Central America	22	1	2	3	4	1		2	2	7
Mexico	19	1	1	1	4	1		2	2	7
Cuba and Islands	5			1				1		3
South America	62	1	12	8	12	1	3	6	5	14
Argentina	10		5	1	2			2		
Brazil	27		1	4	5		1	3	5	8
Chile	2				1					1
Colombia	11	1	2	2	1	1				4
Europe	109	5	14	13	22	4	2	10	3	36
Belgium	6				1		1	2		2
England	12		1	1	3	2		3		2
France	17	3	2	2	2		1	2		5
Fed. Rep. Ger./Ger. Dem. Rep.	2					1				1
Greece	35	1	7	4	4	1		3	1	14
Italy	10	1	1	1	5					2
East Asia	582	24	70	69	121	14	53	81	22	128
China (incl. Taiwan)	336	14	49	40	71	5	30	45	11	71
Hong Kong	27	2	5	3	8	1	1	2	1	4
Japan, Okinawa, Ryukyus	38	2	1	3	8	1	2	6	2	13
Korea	115	5	14	9	20	3	14	21	5	24
Thailand	36		1	12	5	4		4		10
West Asia	464	30	53	53	95	20	17	63	11	122
India	194	21	36	9	35	6	13	20		54
Iran	119	2	6	16	31	6	2	21	7	28
Iraq	6		1	4					1	
Israel	22	4		2	6	3	1	1	1	4
Lebanon	15			3	3			4		5
Turkey	41	1	4	3	6	3		10	1	13
Pakistan	10	1	1		4	1			1	2
Australasia	29	1	2	8	3	2		5		8
Australia	5	1		2	1					1
Indonesia, Rep. of	11		1	4	1	1		4		
New Zealand	4			1				1		2
Philippines	9		1	1	1	1				5
Africa	138	1	11	30	30	4	9	14	6	33
Egypt	45			12	12	1	3	6	1	10
Nigeria	29	1	6	4	2	1	3	1		11
Country unknown	109	3	13	19	18	2	7	9	6	32

SOURCES: National Science Foundation and National Research Council

Table B-30. Primary source of support in graduate school for science doctorate recipients by citizenship status: 1985

Primary support	Number					Percentage distribution			
	Total	Citizenship known	U.S. citizens	Non-U.S. permanent	Non-U.S. temporary	Citizenship known	U.S. citizens	Non-U.S. permanent	Non-U.S. temporary
Total with primary source reported	12,569	12,560	9,990	472	2,098	100.0	100.0	100.0	100.0
Federal fellowships/traineeships	974	974	963	11	0	7.8	9.6	2.3	0
Other Federal support	372	371	303	2	66	3.0	3.0	.4	3.1
University related:									
Research assistantships	3,540	3,540	2,769	135	636	28.2	27.7	28.6	30.3
Teaching assistantships	2,546	2,542	1,891	119	532	20.2	18.9	25.2	25.4
University fellowships	710	707	525	24	158	5.6	5.3	5.1	7.5
Other university	199	199	168	7	24	1.6	1.7	1.5	1.1
Loans	337	337	327	6	4	2.7	3.3	1.3	.2
Own earnings	1,823	1,822	1,654	73	95	14.5	16.6	15.5	4.5
Spouse's earnings	1,012	1,012	963	36	13	8.1	9.6	7.6	.6
Family contributions	339	339	205	32	102	2.7	2.1	6.8	4.9
Business/employer	133	133	87	1	45	1.1	.9	.2	2.1
Other	584	584	135	26	423	4.6	1.4	5.5	20.2

NOTE: This table reports the primary source of graduate student support only, for doctorate recipients who designated their primary sources of support. A clear distinction between Federal support and other sources cannot be made from these data. For instance, substantial portions of the funds used for University Research Assistantships were provided by Federal grants. "Loans" include Government Guaranteed Student Loans, and National Direct Student Loans as well as other loans. The "Other" category includes Nationally Competitive Fellowships (non-Federal), as well as other unspecified sources. The latter includes the home government for foreign students. A few responses that were clearly erroneous were dropped.

SOURCES: National Science Foundation and National Research Council

Table B-31. Primary source of support in graduate school for engineering doctorate recipients by citizenship status: 1985

Primary support	Number					Percentage distribution			
	Total	Citizenship known	U.S. citizens	Non-U.S. permanent	Non-U.S. temporary	Citizenship known	U.S. citizens	Non-U.S. permanent	Non-U.S. temporary
Total with primary source reported	2,586	2,584	1,156	256	1,172	100.0	100.0	100.0	100.0
Federal fellowships/traineeships	39	39	38	1	0	1.5	3.3	.4	0
Other Federal support	68	68	55	2	11	2.6	4.8	.8	.9
University related:									
Research assistantships	1,353	1,351	539	143	669	52.3	46.6	55.9	57.1
Teaching assistantships	294	294	93	39	162	11.4	8.0	15.2	13.8
University fellowships	110	110	61	12	37	4.3	5.3	4.7	3.2
Other university	40	40	22	2	16	1.5	1.9	.8	1.4
Loans	3	3	0	2	1	.1	0	.8	.1
Own earnings	262	262	195	28	39	10.1	16.9	10.9	3.3
Spouse's earnings	67	67	59	4	4	2.6	5.1	1.6	.3
Family contributions	65	65	8	10	47	2.5	.7	3.9	4.0
Business/employer	97	97	60	6	31	3.8	5.2	2.3	2.6
Other	188	188	26	7	155	7.3	2.2	2.7	13.2

NOTE: This table reports the primary source of graduate student support only, for doctorate recipients who designated their primary sources of support. A clear distinction between Federal support and other sources cannot be made from these data. For instance, substantial portions of the funds used for University Research Assistantships were provided by Federal grants. "Loans" include Government Guaranteed Student Loans, and National Direct Student Loans as well as other loans. The "Other" category includes Nationally Competitive Fellowships (non-Federal), as well as other unspecified sources. The latter includes the home government for foreign students. A few responses that were clearly erroneous were dropped.

SOURCES: National Science Foundation and National Research Council

Table B-32. Postgraduation plans of foreign citizens on permanent visas completing science/engineering (S/E) doctorates at U.S. institutions: 1972 and 1985

Field	Total recipients	Total with firm plans	Firm plans loc unknown	Firm plans in U.S.	Postdoc study	Employment	Other, no report	Firm plans abroad
	Number in 1972							
All S/E fields	1,615	890	26	750	288	413	45	114
All sciences	996	585	16	492	216	242	32	77
Physical sciences	318	171	5	150	105	40	5	16
Physics/astronomy	123	61	1	48	28	18	2	12
Chemistry	195	110	4	102	77	22	3	4
Earth/environmental/marine sciences	58	29	0	24	7	12	5	5
Mathematical sciences	65	40	1	34	3	29	2	5
Computer sciences								
Life sciences	305	165	3	138	94	35	8	24
Biological sciences	220	140	2	118	87	24	7	20
Agricultural sciences	85	25	1	20	7	11	1	4
Social sciences	199	142	5	115	2	106	6	22
Psychology	51	38	2	31	5	20	6	5
Engineering	619	305	10	258	72	171	13	37
	Percent of permanent foreign recipients with firm plans, 1972							
All S/E fields		100.0	2.9	84.3	32.4	46.4	5.1	12.8
All sciences		100.0	2.7	84.1	36.9	41.4	5.5	13.2
Physical sciences		100.0	2.9	87.7	61.4	23.4	2.9	9.4
Physics/astronomy		100.0	1.6	78.7	45.9	29.5	3.3	19.7
Chemistry		100.0	3.6	92.7	70.0	20.0	2.7	3.6
Earth/environmental/marine sciences		100.0	.0	82.8	24.1	41.4	17.2	17.2
Mathematical sciences		100.0	2.5	85.0	7.5	72.5	5.0	12.5
Computer sciences								
Life sciences		100.0	1.8	83.6	57.0	21.2	4.8	14.5
Biological sciences		100.0	1.4	84.3	62.1	17.1	5.0	14.3
Agricultural sciences		100.0	4.0	80.0	28.0	44.0	4.0	16.0
Social sciences		100.0	3.5	81.0	1.4	74.6	4.2	15.5
Psychology		100.0	5.3	81.6	13.2	52.6	15.8	13.2
Engineering		100.0	3.3	84.6	23.6	56.1	4.3	12.1
	Number in 1985							
All S/E fields	897	519	40	442	123	313	6	37
All sciences	582	336	28	278	115	159	4	30
Physical sciences	135	88	8	76	38	37	1	4
Physics/astronomy	48	27	2	24	13	11	0	1
Chemistry	87	61	6	52	28	26	1	3
Earth/atmospheric/marine sciences	31	13	1	11	4	7	0	1
Mathematics	42	24	2	19	6	11	2	3
Computer sciences	24	18	0	15	1	14	0	3
Life sciences	151	88	3	73	53	20	0	12
Biological sciences	108	67	2	61	49	12	0	4
Agricultural sciences	43	21	1	12	4	8	0	8
Social sciences	141	70	7	57	3	53	1	6
Psychology	58	35	7	27	10	17	0	1
Engineering	315	183	12	164	8	154	2	7
	Percent of permanent foreign recipients with firm plans, 1985							
All S/E fields		100.0	7.7	85.2	23.7	60.3	1.2	7.1
All sciences		100.0	8.3	82.7	34.2	47.3	1.2	8.9
Physical sciences		100.0	9.1	86.4	43.2	42.0	1.1	4.5
Physics/astronomy		100.0	7.4	88.9	48.1	40.7	.0	3.7
Chemistry		100.0	9.8	85.2	45.9	42.6	1.6	4.9
Earth/atmospheric/marine sciences		100.0	7.7	84.6	30.8	53.8	.0	7.7
Mathematics		100.0	8.3	79.2	25.0	45.8	8.3	12.5
Computer sciences		100.0	.0	83.3	5.6	77.8	.0	16.7
Life sciences		100.0	3.4	83.0	60.2	22.7	.0	13.6
Biological sciences		100.0	3.0	91.0	73.1	17.9	.0	6.0
Agricultural sciences		100.0	4.8	57.1	19.0	38.1	.0	38.1
Social sciences		100.0	10.0	81.4	4.3	75.7	1.4	8.6
Psychology		100.0	20.0	77.1	28.6	48.6	.0	2.9
Engineering		100.0	6.6	89.6	4.4	84.2	1.1	3.8

SOURCES: National Research Council and National Science Foundation

Table B-33. Postgraduation plans of foreign citizens on temporary visas completing science/engineering (S/E) doctorates at U.S. institutions: 1972 and 1985

Field	Total recipients	Total with firm plans	Firm plans loc unknown	Firm plans in U.S.	Postdoc study	Employment	Other, no report	Firm plans abroad
	Number in 1972							
All S/E fields	2,169	1,432	35	408	251	124	30	989
All sciences	1,650	1,132	26	315	196	90	26	791
Physical sciences	387	251	11	105	94	10	0	135
Physics/astronomy	209	137	5	64	56	7	0	68
Chemistry	178	114	6	41	38	3	0	67
Earth/environmental/marine sciences	64	43	0	10	4	4	2	33
Mathematical sciences	169	105	3	42	16	24	2	60
Computer sciences								
Life sciences	537	366	7	83	71	9	1	276
Biological sciences	305	210	5	70	61	6	1	135
Agricultural sciences	232	156	2	13	10	3	0	141
Social sciences	415	317	3	62	9	33	20	252
Psychology	78	50	2	13	2	10	1	35
Engineering	519	300	9	93	55	34	4	198
	Percent of temporary foreign recipients with firm plans, 1972							
All S/E fields		100.0	2.4	28.5	17.5	8.7	2.1	69.1
All sciences		100.0	2.3	27.8	17.3	8.0	2.3	69.9
Physical sciences		100.0	4.4	41.8	37.5	4.0	.0	53.8
Physics/astronomy		100.0	3.6	46.7	40.9	5.1	.0	49.6
Chemistry		100.0	5.3	36.0	33.3	2.7	.0	58.8
Earth/environmental/marine sciences		100.0	.0	23.3	9.3	9.3	4.7	76.7
Mathematical sciences		100.0	2.9	40.0	15.2	22.9	1.9	57.1
Computer sciences								
Life sciences		100.0	1.9	22.7	19.4	2.4	.3	75.4
Biological sciences		100.0	2.4	33.3	29.0	2.9	.5	64.3
Agricultural sciences		100.0	1.3	8.3	6.4	1.9	.0	90.4
Social sciences		100.0	.9	19.6	2.8	10.4	6.3	79.5
Psychology		100.0	4.0	26.0	4.0	20.0	2.0	70.0
Engineering		100.0	3.0	31.0	18.3	11.4	1.3	66.0
	Number in 1985							
All S/E fields	3,950	2,474	205	1,220	609	604	7	1,049
All sciences	2,537	1,657	127	756	470	282	4	774
Physical sciences	619	391	41	260	218	42	0	90
Physics/astronomy	289	190	19	122	96	26	0	49
Chemistry	330	201	22	138	122	16	0	41
Earth/atmospheric/marine sciences	117	77	1	33	26	7	0	43
Mathematics	239	166	14	98	19	78	1	54
Computer sciences	89	65	2	47	12	35	0	16
Life sciences	777	511	29	180	164	15	1	302
Biological sciences	422	285	11	151	143	7	1	123
Agricultural sciences	355	226	18	29	21	8	0	179
Social sciences	614	395	35	119	20	97	2	241
Psychology	82	52	5	19	11	8	0	28
Engineering	1,413	817	78	464	139	322	3	275
	Percent of temporary foreign recipients with firm plans, 1985							
All S/E fields		100.0	8.3	49.3	24.6	24.4	0.3	42.4
All sciences		100.0	7.7	45.6	28.4	17.0	.2	46.7
Physical sciences		100.0	10.5	66.5	55.8	10.7	.0	23.0
Physics/astronomy		100.0	10.0	64.2	50.5	13.7	.0	25.8
Chemistry		100.0	10.9	68.7	60.7	8.0	.0	20.4
Earth/atmospheric/marine sciences		100.0	1.3	42.9	33.8	9.1	.0	55.8
Mathematics		100.0	8.4	59.0	11.4	47.0	.6	32.5
Computer sciences		100.0	3.1	72.3	18.5	53.8	.0	24.6
Life sciences		100.0	5.7	35.2	32.1	2.9	.2	59.1
Biological sciences		100.0	3.9	53.0	50.2	2.5	.4	43.2
Agricultural sciences		100.0	8.0	12.8	9.3	3.5	.0	79.2
Social sciences		100.0	8.9	30.1	5.1	24.6	.5	61.0
Psychology		100.0	9.6	36.5	21.2	15.4	.0	53.8
Engineering		100.0	9.5	56.8	17.0	39.4	.4	33.7

SOURCES: National Research Council and National Science Foundation

Table B-34. Foreign science/engineering postdoctorates in doctorate-granting institutions by field: 1979-85

FIELD	NUMBER							AVERAGE ANNUAL PERCENT CHANGE		
	1979	1980	1981	1982	1983	1984	1985	1979-84	1984-85	1979-85
TOTAL, ALL FIELDS	6,054	6,506	7,297	7,235	7,538	8,020	8,959	5.8	11.7	6.8
ENGINEERING	653	676	709	657	692	760	919	3.1	20.9	5.9
AEROSPACE	23	14	6	19	24	32	41	6.8	28.1	10.1
AGRICULTURAL	5	5	5	3	1	4	9	-4.4	125.0	10.3
BIOMEDICAL	10	11	14	6	8	13	20	5.4	53.8	12.2
CHEMICAL	127	137	128	133	143	180	218	7.2	21.1	9.4
CIVIL	70	65	73	70	79	93	73	5.8	-21.5	.7
ELECTRICAL	74	82	87	94	107	110	100	8.3	-9.1	5.1
ENGINEERING SCIENCE	39	50	50	41	32	38	49	-.5	28.9	3.9
INDUSTRIAL	5	8	7	5	8	10	2	14.9	-80.0	-14.2
MECHANICAL	86	94	106	100	113	114	153	5.8	34.2	10.1
METALLURGICAL/MATERIALS	168	145	168	138	151	116	198	-7.1	70.7	2.8
MINING	5	2	11	8	1	0	0	-100.0	**	-100.0
NUCLEAR	16	17	22	8	9	12	19	-5.6	58.3	2.9
PETROLEUM	4	5	2	2	0	3	5	-5.6	66.7	3.8
ENGINEERING, N.E.C.	21	41	30	30	16	35	32	10.8	-8.6	7.3
SCIENCES, TOTAL	5,401	5,830	6,588	6,578	6,846	7,260	8,040	6.1	10.7	6.9
PHYSICAL SCIENCES	2,014	2,159	2,358	2,367	2,385	2,412	2,501	3.7	3.7	3.7
ASTRONOMY	38	42	37	33	26	32	43	-3.4	34.4	2.1
CHEMISTRY	1,429	1,515	1,654	1,661	1,667	1,656	1,718	3.0	3.7	3.1
PHYSICS	547	598	667	673	689	708	733	5.3	3.5	5.0
PHYSICAL SCIENCES, N.E.C.	0	4	0	0	3	16	7	**	-56.3	**
ENVIRONMENTAL SCIENCES	110	102	126	121	159	164	125	8.3	-23.8	2.2
ATMOSPHERIC SCIENCES	16	17	22	17	21	23	15	7.5	-34.8	-1.1
GEOSCIENCES	81	70	81	84	100	108	90	5.9	-16.7	1.8
OCEANOGRAPHY	13	13	19	18	31	30	15	18.2	-50.0	2.4
ENVIRONMENTAL SCIENCES, N.E.C.	0	2	4	2	7	3	5	**	66.7	**
MATHEMATICAL SCIENCES	80	92	61	126	90	100	114	4.6	14.0	6.1
COMPUTER SCIENCES	13	13	16	12	45	21	29	10.1	38.1	14.3
LIFE SCIENCES	3,049	3,289	3,850	3,786	3,990	4,413	5,090	7.7	15.3	8.9
AGRICULTURAL SCIENCES	74	93	113	116	81	102	142	6.6	39.2	11.5
BIOLOGICAL SCIENCES	1,902	2,099	2,378	2,397	2,574	2,815	3,231	8.2	14.8	9.2
ANATOMY	45	39	57	51	74	65	77	7.6	18.5	9.4
BIOCHEMISTRY	530	610	708	626	648	716	842	6.2	17.6	8.0
BIOLOGY	239	255	237	274	274	291	280	4.0	-3.8	2.7
BIOMETRY/EPIDEMIOLOGY	14	10	18	14	20	9	13	-8.5	44.4	-1.2
BIOPHYSICS	18	51	69	51	61	47	29	21.2	-38.3	8.3
BOTANY	52	62	75	96	100	87	103	10.8	18.4	12.1
CELL BIOLOGY	97	125	160	159	169	213	249	17.0	16.9	17.0
ECOLOGY	3	6	8	2	4	4	8	5.9	100.0	17.8
ENTOMOLOGY/PARASITOLOGY	28	27	29	30	30	21	36	-5.6	71.4	4.3
GENETICS	65	70	80	76	100	116	114	12.3	-1.7	9.8
MICROBIOLOGY	213	220	271	309	289	328	425	9.0	29.6	12.2
NUTRITION	43	53	57	37	50	59	83	6.5	40.7	11.6
PATHOLOGY	105	118	121	161	169	171	226	10.2	32.2	13.6
PHARMACOLOGY	200	221	248	296	308	315	321	9.5	1.9	8.2
PHYSIOLOGY	176	180	184	169	217	266	306	8.6	15.0	9.7
ZOOLOGY	49	26	38	28	32	28	33	-10.6	17.9	-6.4
BIOSCIENCES, N.E.C.	25	26	18	18	29	79	86	25.9	8.9	22.9
HEALTH SCIENCES	1,073	1,097	1,359	1,273	1,335	1,496	1,717	6.9	14.8	8.2
DENTISTRY	27	9	42	51	65	59	67	16.9	13.6	16.4
NEUROLOGY	62	60	74	64	86	104	105	10.9	1.0	9.2
NURSING	0	0	0	0	0	0	1	**	**	**
PHARMACEUTICAL SCIENCES	125	171	150	151	131	161	195	5.2	21.1	7.7
PREVENTIVE MEDICINE/ COMMUNITY HEALTH	24	27	32	22	24	39	38	10.2	-2.6	8.0
SPEECH PATHOLOGY/AUDIOLOGY	1	1	3	2	2	1	2	.0	100.0	12.2
VETERINARY SCIENCES	6	10	9	8	5	10	18	10.8	80.0	20.1
CLINICAL MEDICINE, N.E.C.	802	779	1,015	958	998	1,097	1,257	6.5	14.6	7.8
HEALTH RELATED, N.E.C.	26	40	34	17	24	25	34	-.8	36.0	4.6
PSYCHOLOGY	34	30	54	65	61	46	54	6.2	17.4	8.0
SOCIAL SCIENCES	101	145	123	101	116	104	127	.6	22.1	3.9
AGRICULTURAL ECONOMICS	4	2	1	6	8	4	10	.0	150.0	16.5
ANTHROPOLOGY	7	3	4	3	9	9	8	5.2	-11.1	2.3
ECONOMICS (EXCEPT AGRICULTURAL)	48	52	11	9	11	14	9	-21.8	-35.7	-24.3
GEOGRAPHY	3	11	16	4	7	7	8	18.5	14.3	17.8
HISTORY AND PHILOSOPHY OF SCIENCE	4	8	8	6	8	7	5	11.8	-28.6	3.8
LINGUISTICS	20	32	27	26	29	13	11	-8.3	-15.4	-9.5
POLITICAL SCIENCE	4	11	24	18	16	17	30	33.6	76.5	39.9
SOCIOLOGY	9	15	11	17	15	17	22	13.6	29.4	16.1
SOCIOLOGY/ANTHROPOLOGY	0	0	0	1	1	0	2	**	**	**
SOCIAL SCIENCES, N.E.C.	2	11	21	11	12	16	22	51.6	37.5	49.1

SOURCE: NATIONAL SCIENCE FOUNDATION

Table B-35. Science/engineering postdoctorates with U.S. citizenship in doctorate-granting institutions by field: 1979-85

FIELD	NUMBER							AVERAGE ANNUAL PERCENT CHANGE		
	1979	1980	1981	1982	1983	1984	1985	1979-84	1984-85	1979-85
TOTAL, ALL FIELDS	12,032	11,905	12,349	12,131	13,224	13,626	13,732	2.5	0.8	2.2
ENGINEERING	414	302	331	321	410	435	445	1.0	2.3	1.2
AEROSPACE	9	6	8	6	8	10	10	2.1	.0	1.8
AGRICULTURAL	20	4	4	3	3	4	6	-27.5	50.0	-18.2
BIOMEDICAL	22	17	20	25	20	21	27	-.9	28.6	3.5
CHEMICAL	65	46	43	41	55	65	55	.0	-15.4	-2.7
CIVIL	58	59	34	38	52	53	49	-1.8	-7.5	-2.8
ELECTRICAL	68	39	104	82	67	61	76	-2.1	24.6	1.9
ENGINEERING SCIENCE	35	29	37	35	39	25	41	-6.5	64.0	2.7
INDUSTRIAL	3	8	6	4	6	12	18	32.0	50.0	34.8
MECHANICAL	57	43	24	30	69	82	64	7.5	-22.0	1.9
METALLURGICAL/MATERIALS	41	27	25	28	53	52	47	4.9	-9.6	2.3
MINING	0	1	5	2	18	18	19	**	5.6	**
NUCLEAR	4	5	4	10	6	7	12	11.8	71.4	20.1
PETROLEUM	2	1	0	2	1	1	1	-12.9	.0	-10.9
ENGINEERING, N.E.C.	30	17	17	15	13	24	20	-4.4	-16.7	-6.5
SCIENCES, TOTAL	11,618	11,603	12,018	11,810	12,814	13,191	13,287	2.6	.7	2.3
PHYSICAL SCIENCES	2,011	2,105	2,104	1,914	2,059	1,974	2,016	-.4	2.1	*
ASTRONOMY	94	99	95	115	85	86	95	-1.8	10.5	.2
CHEMISTRY	1,175	1,195	1,216	1,144	1,306	1,250	1,277	1.2	2.2	1.4
PHYSICS	740	800	778	653	661	612	609	-3.7	-.5	-3.2
PHYSICAL SCIENCES, N.E.C.	2	11	15	2	7	26	35	67.0	34.6	61.1
ENVIRONMENTAL SCIENCES	205	206	213	214	256	324	250	9.6	-22.8	3.4
ATMOSPHERIC SCIENCES	15	26	24	15	20	51	33	27.7	-35.3	14.0
GEOSCIENCES	138	124	132	132	137	142	136	.6	-4.2	-.2
OCEANOGRAPHY	41	44	48	60	89	121	64	24.2	-47.1	7.7
ENVIRONMENTAL SCIENCES, N.E.C.	11	12	9	7	10	10	17	-1.9	70.0	7.5
MATHEMATICAL SCIENCES	82	70	52	68	80	103	117	4.7	13.6	6.1
COMPUTER SCIENCES	25	30	18	34	37	42	45	10.9	7.1	10.3
LIFE SCIENCES	8,576	8,454	9,005	8,939	9,767	10,119	10,174	3.4	.5	2.9
AGRICULTURAL SCIENCES	141	146	171	163	214	256	215	12.7	-16.0	7.3
BIOLOGICAL SCIENCES	4,973	5,007	5,328	5,359	5,809	5,982	6,053	3.8	1.2	3.3
ANATOMY	199	198	191	210	210	226	243	2.6	7.5	3.4
BIOCHEMISTRY	1,032	989	1,016	1,058	1,117	1,103	1,067	1.3	-3.3	.6
BIOLOGY	726	734	633	668	740	836	847	2.9	1.3	2.6
BIOMETRY/EPIDEMIOLOGY	54	62	46	39	34	58	46	1.4	-20.7	-2.6
BIOPHYSICS	83	100	86	78	122	74	72	-2.3	-2.7	-2.3
BOTANY	111	158	165	202	269	260	270	18.6	3.8	16.0
CELL BIOLOGY	255	285	372	357	484	455	504	12.3	10.8	12.0
ECOLOGY	15	16	36	26	35	32	29	16.4	-9.4	11.6
ENTOMOLOGY/PARASITOLOGY	76	92	104	89	82	92	103	3.9	12.0	5.2
GENETICS	174	188	218	238	244	266	263	8.9	-1.1	7.1
MICROBIOLOGY	648	653	696	705	732	748	737	2.9	-1.5	2.2
NUTRITION	127	76	114	101	101	91	119	-6.4	30.8	-1.1
PATHOLOGY	324	359	347	379	415	438	400	6.2	-8.7	3.6
PHARMACOLOGY	437	403	507	481	493	501	540	2.8	7.8	3.6
PHYSIOLOGY	505	488	574	504	537	556	539	1.9	-3.1	1.1
ZOOLOGY	166	167	169	175	151	129	180	-4.9	39.5	1.4
BIOSCIENCES, N.E.C.	41	39	54	49	43	117	94	23.3	-19.7	14.8
HEALTH SCIENCES	3,462	3,301	3,506	3,417	3,744	3,881	3,906	2.3	.6	2.0
DENTISTRY	75	70	97	195	132	127	157	11.1	23.6	13.1
NEUROLOGY	203	223	213	190	215	248	218	4.1	-12.1	1.2
NURSING	7	9	8	0	6	14	19	14.9	35.7	18.1
PHARMACEUTICAL SCIENCES	110	62	93	87	110	108	123	-.4	13.9	1.9
PREVENTIVE MEDICINE/ COMMUNITY HEALTH	88	134	103	121	122	131	138	8.3	5.3	7.8
SPEECH PATHOLOGY/AUDIOLOGY	35	17	16	8	16	17	16	-13.4	-5.9	-12.2
VETERINARY SCIENCES	16	42	22	41	45	68	51	33.6	-25.0	21.3
CLINICAL MEDICINE, N.E.C.	2,859	2,682	2,875	2,700	3,006	3,075	3,064	1.5	-.4	1.2
HEALTH RELATED, N.E.C.	69	62	79	75	92	93	120	6.2	29.0	9.7
PSYCHOLOGY	420	445	417	455	374	376	444	-2.2	18.1	.9
SOCIAL SCIENCES	299	293	209	186	241	253	241	-3.3	-4.7	-3.5
AGRICULTURAL ECONOMICS	2	6	5	4	20	14	21	47.6	50.0	48.0
ANTHROPOLOGY	34	37	26	31	51	48	49	7.1	2.1	6.3
ECONOMICS (EXCEPT AGRICULTURAL)	51	94	19	4	9	12	10	-25.1	-16.7	-23.8
GEOGRAPHY	2	4	7	1	0	7	2	28.5	-71.4	.0
HISTORY AND PHILOSOPHY OF SCIENCE	7	7	13	8	11	5	6	-6.5	20.0	-2.5
LINGUISTICS	10	22	20	21	22	17	15	11.2	-11.8	7.0
POLITICAL SCIENCE	25	19	22	26	27	14	14	-10.9	.0	-9.2
SOCIOLOGY	106	84	79	72	84	97	70	-1.8	-27.8	-6.7
SOCIOLOGY/ANTHROPOLOGY	4	3	0	1	0	0	0	-100.0	**	-100.0
SOCIAL SCIENCES, N.E.C.	58	17	18	18	17	39	54	-7.6	38.5	-1.2

SOURCE: NATIONAL SCIENCE FOUNDATION

Table B-36. Science/engineering postdoctorates in doctorate-granting institutions by field: 1979-85

FIELD	NUMBER							AVERAGE ANNUAL PERCENT CHANGE		
	1979	1980	1981	1982	1983	1984	1985	1979-84	1984-85	1979-85
TOTAL, ALL FIELDS	18,086	18,411	19,646	19,366	20,762	21,646	22,691	3.7	4.8	3.9
ENGINEERING	1,067	978	1,040	978	1,102	1,195	1,364	2.3	14.1	4.2
AEROSPACE	32	20	14	25	32	42	51	5.6	21.4	8.1
AGRICULTURAL	25	9	9	6	4	8	15	-20.4	87.5	-8.2
BIOMEDICAL	32	28	34	31	28	34	47	1.2	38.2	6.6
CHEMICAL	192	183	171	174	198	245	273	5.0	11.4	6.0
CIVIL	128	124	107	108	131	146	122	2.7	-16.4	-.8
ELECTRICAL	142	121	191	176	174	171	176	3.8	2.9	3.6
ENGINEERING SCIENCE	74	79	87	76	71	63	90	-3.2	42.9	3.3
INDUSTRIAL	8	16	13	9	14	22	20	22.4	-9.1	16.5
MECHANICAL	143	137	130	130	182	196	217	6.5	10.7	7.2
METALLURGICAL/MATERIALS	209	172	193	166	204	168	245	-4.3	45.8	2.7
MINING	5	3	16	10	19	18	19	29.2	5.6	24.9
NUCLEAR	20	22	26	18	15	19	31	-1.0	63.2	7.6
PETROLEUM	6	6	2	4	1	4	6	-7.8	50.0	.0
ENGINEERING, N.E.C.	51	58	47	45	29	59	52	3.0	-11.9	.3
SCIENCES, TOTAL	17,019	17,433	18,606	18,388	19,660	20,451	21,327	3.7	4.3	3.8
PHYSICAL SCIENCES	4,025	4,264	4,462	4,281	4,444	4,386	4,517	1.7	3.0	1.9
ASTRONOMY	132	141	132	148	111	118	138	-2.2	16.9	.7
CHEMISTRY	2,604	2,710	2,870	2,805	2,973	2,906	2,995	2.2	3.1	2.4
PHYSICS	1,287	1,398	1,445	1,326	1,350	1,320	1,342	.5	1.7	.7
PHYSICAL SCIENCES, N.E.C.	2	15	15	2	10	42	42	83.8	.0	66.1
ENVIRONMENTAL SCIENCES	315	308	339	335	415	488	375	9.1	-23.2	2.9
ATMOSPHERIC SCIENCES	31	43	46	32	41	74	48	19.0	-35.1	7.6
GEOSCIENCES	219	194	213	216	237	250	226	2.7	-9.6	.5
OCEANOGRAPHY	54	57	67	78	120	151	79	22.8	-47.7	6.5
ENVIRONMENTAL SCIENCES, N.E.C.	11	14	13	9	17	13	22	3.4	69.2	12.2
MATHEMATICAL SCIENCES	162	162	113	194	170	203	231	4.6	13.8	6.1
COMPUTER SCIENCES	38	43	34	46	82	63	74	10.6	17.5	11.7
LIFE SCIENCES	11,625	11,743	12,855	12,725	13,757	14,532	15,264	4.6	5.0	4.6
AGRICULTURAL SCIENCES	215	239	284	279	295	358	357	10.7	-.3	8.8
BIOLOGICAL SCIENCES	6,875	7,106	7,706	7,756	8,383	8,797	9,284	5.1	5.5	5.1
ANATOMY	244	237	248	261	284	291	320	3.6	10.0	4.6
BIOCHEMISTRY	1,562	1,599	1,724	1,684	1,765	1,819	1,909	3.1	4.9	3.4
BIOLOGY	965	989	870	942	1,014	1,127	1,127	3.2	.0	2.6
BIOMETRY/EPIDEMIOLOGY	68	72	64	53	54	67	59	-.3	-11.9	-2.3
BIOPHYSICS	101	151	155	129	183	121	101	3.7	-16.5	.0
BOTANY	163	220	240	298	369	347	373	16.3	7.5	14.8
CELL BIOLOGY	352	410	532	516	653	668	753	13.7	12.7	13.5
ECOLOGY	18	22	44	28	39	36	37	14.9	2.8	12.8
ENTOMOLOGY/PARASITOLOGY	104	119	133	119	112	113	139	1.7	23.0	5.0
GENETICS	239	258	298	314	344	382	377	9.8	-1.3	7.9
MICROBIOLOGY	861	873	967	1,014	1,021	1,076	1,162	4.6	8.0	5.1
NUTRITION	170	129	171	138	151	150	202	-2.5	34.7	2.9
PATHOLOGY	429	477	468	540	584	609	626	7.3	2.8	6.5
PHARMACOLOGY	637	624	755	777	801	816	861	5.1	5.5	5.2
PHYSIOLOGY	681	668	756	673	754	822	845	3.8	2.8	3.7
ZOOLOGY	215	193	207	203	183	157	213	-6.1	35.7	-.2
BIOSCIENCES, N.E.C.	66	65	72	67	72	196	180	24.3	-8.2	18.2
HEALTH SCIENCES	4,535	4,398	4,865	4,690	5,079	5,377	5,623	3.5	4.6	3.6
DENTISTRY	102	79	139	246	197	186	224	12.8	20.4	14.0
NEUROLOGY	265	283	287	254	301	352	323	5.8	-8.2	3.4
NURSING	7	9	8	0	6	14	20	14.9	42.9	19.1
PHARMACEUTICAL SCIENCES	235	233	243	238	241	269	318	2.7	18.2	5.2
PREVENTIVE MEDICINE/ COMMUNITY HEALTH	112	161	135	143	146	170	176	8.7	3.5	7.8
SPEECH PATHOLOGY/AUDIOLOGY	36	18	19	10	18	18	18	-12.9	.0	-10.9
VETERINARY SCIENCES	22	52	31	49	50	78	69	28.8	-11.5	21.0
CLINICAL MEDICINE, N.E.C.	3,661	3,461	3,890	3,658	4,004	4,172	4,321	2.6	3.6	2.8
HEALTH RELATED, N.E.C.	95	102	113	92	116	118	154	4.4	30.5	8.4
PSYCHOLOGY	454	475	471	520	435	422	498	-1.5	18.0	1.6
SOCIAL SCIENCES	400	438	332	287	357	357	368	-2.2	3.1	-1.4
AGRICULTURAL ECONOMICS	6	8	6	10	28	18	31	24.6	72.2	31.5
ANTHROPOLOGY	41	40	30	34	60	57	57	6.8	.0	5.6
ECONOMICS (EXCEPT AGRICULTURAL)	99	146	30	13	20	26	19	-23.5	-26.9	-24.1
GEOGRAPHY	5	15	23	5	7	14	10	22.9	-28.6	12.2
HISTORY AND PHILOSOPHY OF SCIENCE	11	15	21	14	19	12	11	1.8	-8.3	.0
LINGUISTICS	30	54	47	47	51	30	26	.0	-13.3	-2.4
POLITICAL SCIENCE	29	30	46	44	43	31	44	1.3	41.9	7.2
SOCIOLOGY	115	99	90	89	99	114	92	-.2	-19.3	-3.7
SOCIOLOGY/ANTHROPOLOGY	4	3	0	2	1	0	2	-100.0	**	-10.9
SOCIAL SCIENCES, N.E.C.	60	28	39	29	29	55	76	-1.7	38.2	4.0

SOURCE: NATIONAL SCIENCE FOUNDATION

B-37. Distribution of employed scientists and engineers by occupation and citizenship status: 1982

Type of employer	Total	Native-born U.S. citizens	Foreign citizens	Naturalized U.S. citizens
Total	100	83	4	13
Self-employed	100	83	3	14
Business/industry	100	83	4	14
Junior college/technical institutes	100	89	2	9
Medical school	100	80	9	11
Four-year college/universities	100	83	6	12
Hospital/clinic	100	80	4	16
Nonprofit organization (other than those listed above)	100	81	5	14
U.S. military	100	88	[1]	11
U.S. Government, civilian employment	100	89	[1]	12
State government	100	86	2	13
Local government/foreign government	100	80	3	17
International agency	100	43	43	14
Other	100	82	3	15

[1] Less than 0.5.

NOTE: Details may not add to totals because of rounding.

SOURCE: *Foreign National Scientists and Engineers in the U.S. Labor Force, 1972-1982*, Oak Ridge Associated Universities, ORAU-244, June 1985, based on work supported by National Science Foundation grant number SRS-8308230, Michael G. Finn, principal investigator

Table B-38. Distribution of employed scientists and engineers by type of employer and citizenship status: 1982

Occupation	Total	Native-born U.S. citizens	Foreign citizens	Naturalized U.S. citizens
Total	100	83	4	13
Computer scientists	100	87	3	10
Mathematical scientists	100	82	5	13
Physical scientists	100	83	5	12
Physicists/astronomers	100	82	6	12
Chemists	100	81	6	13
Earth scientists	100	89	2	10
Other physical scientists	100	84	3	13
Engineers	100	82	4	15
Aeronautical/astronautical engineers	100	83	3	15
Civil engineers	100	79	3	18
Chemical engineers	100	80	5	16
Electrical/electronics engineers	100	80	4	14
Industrial engineers	100	84	3	13
Nuclear engineers	100	81	4	16
Mechanical engineers	100	80	4	16
Petroleum engineers	100	86	6	9
Mining, mineral engineers	100	83	5	11
Materials engineers	100	79	8	13
Other engineers	100	83	3	14
Life scientists	100	85	4	11
Agricultural scientists	100	89	1	10
Biological/medical scientists	100	83	5	12
Psychologists	100	89	1	10
Social scientists	100	86	4	11
Economists	100	82	6	12
Other social scientists	100	88	3	10

NOTE: Details may not add to totals because of rounding.

SOURCE: *Foreign National Scientists and Engineers in the U.S. Labor Force, 1972-1982*, Oak Ridge Associated Universities, ORAU-244, June 1985, based on work supported by National Science Foundation grant number SRS-8308230, Michael G. Finn, principal investigator

Table B-39. Distribution of employed scientists and engineers by primary work activity and citizenship status: 1982

Primary work activity	Total	Percent	Native U.S. citizens	Percent	Foreign citizens	Percent	Naturalized U.S. citizens	Percent
Total	1,337,153	100.0	1,111,613	100.0	46,503	100.0	179,037	100.0
R&D management	83,150	6.2	69,811	6.3	2,166	4.7	11,173	6.2
Management, other	168,318	12.6	145,851	13.1	2,741	5.9	19,726	11.0
Teaching/training	122,391	9.2	104,320	9.4	4,920	10.6	13,151	7.3
Research (basic and applied)	137,067	10.3	110,065	9.9	8,159	17.5	18,843	10.5
Development	193,121	14.4	156,807	14.1	8,581	18.5	27,733	15.5
Design	142,277	10.6	115,124	10.4	6,244	13.4	20,909	11.7
Operations	115,521	8.6	98,122	8.8	3,030	6.5	14,369	8.0
Consulting	80,652	6.0	66,061	5.9	3,235	7.0	11,356	6.3
Computer applications	98,929	7.4	86,692	7.8	2,343	5.0	9,894	5.5
All other	170,746	12.8	144,961	13.0	4,295	9.2	21,490	12.0
No response	24,981	1.9	13,799	1.2	789	1.7	10,393	5.8

NOTE: It is necessary to adjust the above numbers upward to get population estimates. The totals in these tables include only persons who indicated during the 1980 census that they were employed in a science or engineering or related occupation (NSF strata 1-10).

SOURCE: *Foreign National Scientists and Engineers in the U.S. Labor Force, 1972-1982*, Oak Ridge Associated Universities, ORAU-244, June 1985, based on work suppored by National Science Foundation grant number SRS-8308230, Michael G. Finn, principal investigator

Table B-40. Estimates and projections of 22- and 30-year-olds in the total U.S. population: 1970 to 2000

Year	22-year-old U.S. population (thousands)			30-year-old U.S. population (thousands)		
	Total	Men	Women	Total	Men	Women
Actual						
1970	3,494	1,757	1,737	2,488	1,232	1,256
1971	3,509	1,759	1,750	2,632	1,306	1,326
1972	3,511	1,762	1,749	2,795	1,388	1,407
1973	3,656	1,839	1,817	3,178	1,579	1,599
1974	3,757	1,892	1,865	3,008	1,492	1,516
1975	3,863	1,944	1,919	2,966	1,473	1,493
1976	3,971	1,996	1,975	2,913	1,452	1,461
1977	4,056	2,041	2,015	4,000	1,999	2,001
1978	4,119	2,072	2,047	3,721	1,855	1,866
1979	4,285	2,158	2,127	3,734	1,857	1,877
1980	4,315	2,177	2,138	3,737	1,860	1,877
1981	4,312	2,173	2,139	3,886	1,935	1,951
1982	4,300	2,169	2,131	3,990	1,993	1,997
1983	4,369	2,204	2,165	4,107	2,053	2,054
1984	4,282	2,160	2,112	4,225	2,144	2,111
1985	4,212	2,126	2,086	4,322	2,169	2,154
Projected						
1986	4,212	2,144	2,068	4,242	2,119	2,123
1987	4,039	2,051	1,988	4,369	2,185	2,184
1988	3,800	1,932	1,868	4,394	2,204	2,190
1989	3,684	1,869	1,815	4,445	2,230	2,215
1990	3,601	1,830	1,771	4,513	2,266	2,247
1991	3,693	1,877	1,816	4,569	2,294	2,275
1992	3,798	1,934	1,864	4,356	2,194	2,162
1993	3,803	1,936	1,867	4,332	2,192	2,140
1994	3,459	1,760	1,699	4,283	2,164	2,119
1995	3,345	1,701	1,644	4,113	2,073	2,040
1996	3,228	1,642	1,586	3,876	1,955	1,921
1997	3,304	1,632	1,622	3,762	1,894	1,868
1998	3,250	1,653	1,597	3,680	1,855	1,825
1999	3,360	1,710	1,650	3,772	1,902	1,870
2000	3,350	1,704	1,646	3,876	1,958	1,918

SOURCE: Department of Commerce, Bureau of the Census, *Projections of the Population of the United States, by Age, Sex, and Race: 1983 to 2080*, Current Population Reports Series P-25, No. 952 and *Estimates of the Population of the United States, by Age, Sex, and Race: 1980 to 1985*, Current Population Reports Series P-25, No. 985

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